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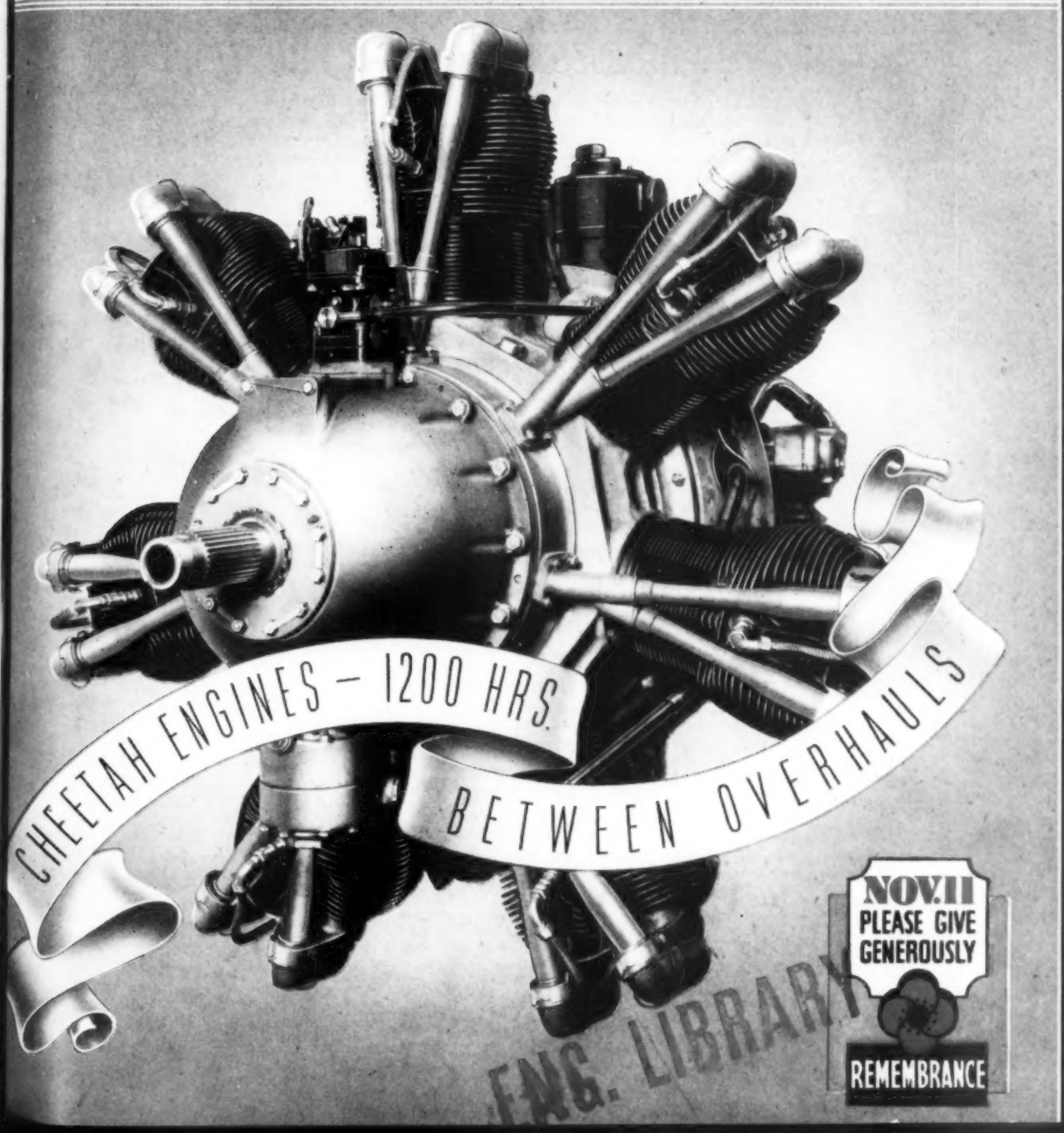
FLIGHT

and The AIRCRAFT ENGINEER

c.1

OFFICIAL ORGAN OF THE ROYAL AERO CLUB

NOVEMBER 11th, 1943



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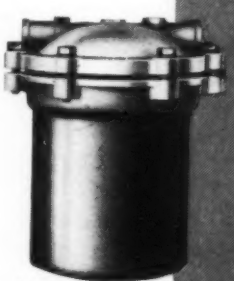

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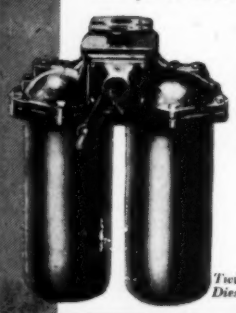
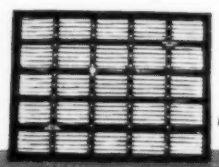


Twin fuel oil filter for Diesel Engines.



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FLIGHT and The AIRCRAFT ENGINEER

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The Outlook

Administrative Innovations

IN last week's issue of *Flight* it was briefly mentioned that two observer officers have been given the command of bomber squadrons. Enquiries from the Air Ministry elicited a denial that this marked a new principle; an assertion, in fact, that it was only an application of common sense. As a matter of fact one air gunner, who is a Wing Commander, an M.B.E. and a D.F.C., has also been given command of a squadron, while in a few squadrons navigators have been appointed to the command of flights.

We agree that this is only common sense, yet it is a novelty in practice and a break with Air Force traditions. In the last war, in the R.F.C. and later in the R.A.F., nobody ever thought of giving command of a squadron or flight to any officer who was not a pilot. Observers were almost looked on as an inferior race of beings, men who could be flown but who could not fly. The pilot's brevet was much more highly regarded than the single wing of an observer, despite the fact that the former was awarded at training schools, while the latter could only be won by a certain minimum number of flights across the trench lines.

In some R.A.F. circles it was regarded as almost a heresy when the Admiralty announced in 1937 that in the Fleet Air Arm observers were eligible for the command of flights or squadrons, and that in a multi-seater the senior officer would be in command of the aircraft.

There is a good deal of difference between the executive command of an aircraft and the administrative command of a flight or squadron. The qualities required are different, and it is not always the best pilot who is the best organiser. The necessary qualities may be found in an observer or air gunner, and then it is only common sense to give that man the command.

In one particular the Air Force has adopted a principle which would never have been thought possible in the older Services before this war. The captain of an aircraft must always be the pilot, even though he may be a sergeant while one of his crew is an officer. That seems to us quite right in the case of a heavy bomber, though a little doubtful in the case of a machine out purely for reconnaissance. The pilot alone can give the order to "abandon aircraft." But his authority only exists while the machine is in the air. Once the crew is in the dinghy or on the ground seniority in rank once again is the rule, and the officer who may have been only "tail-end Charley" in the air takes command over the sergeant pilot who a few minutes before was his captain.

Transoceanic Air Lines

WHEN, some years before this war, the great railway companies combined with Imperial Airways to found Railway Air Services, Ltd., the project aroused no little animosity in some quarters. For one thing, Imperial Airways received a Government subsidy (though this was granted for oversea routes) and also it was feared that the railway companies might be more interested in crushing a possible rival than in actively promoting the interests of air transport.

Without discussing the pros and cons of that controversy, we may point out that they only applied to internal air services, and that commercial air transport across the oceans is quite another matter. Five leading shipping companies are forming a separate company to operate air services between the United Kingdom, the Continent, and South America, "as soon as the necessary consents and permits can be obtained." We can see no reason why the necessary permits, at least, should

not be obtained, though the aircraft may take time. It is understood that another group is prepared to deal with air transport across the North Atlantic.

This action should go far to settle the vexed question of whether the Government is to work in the future through one "chosen instrument," or in other words to grant a monopoly of subsidy to one company. The monopoly can only apply to the subsidy. If an independent firm is prepared to finance air transport out of its own resources, so much the better.

Nor need there be any suspicion that the shipping companies want to control air transport for the purpose of killing a possible rival. They stand to gain much by using it as an ally. Heavy cargoes will always go by sea, for speed seldom matters much in their case and cheapness of transport does. For passengers in a hurry, mails, and other urgent matter the transport of the future is undoubtedly by air. The vast, speedy liners of the past were a tremendous drain on the resources of the companies. Aircraft are ten times as fast as any ship, and now offer quite as much comfort and luxury as is necessary. The future should lie with large, fast aircraft and steamers of moderate speed.

Yet one more advantage can be seen in the participation of shipping companies in air transport. Those companies may not as yet understand all about aircraft, but they can buy that knowledge. What they do understand is traffic, and how to make it pay. They have ample resources of capital, and great experience of transport as a subject, which some air-line operators have not always had. In fact, an alliance between aircraft and ships is a thing to be cordially welcomed by all who have the interests of air transport at heart.

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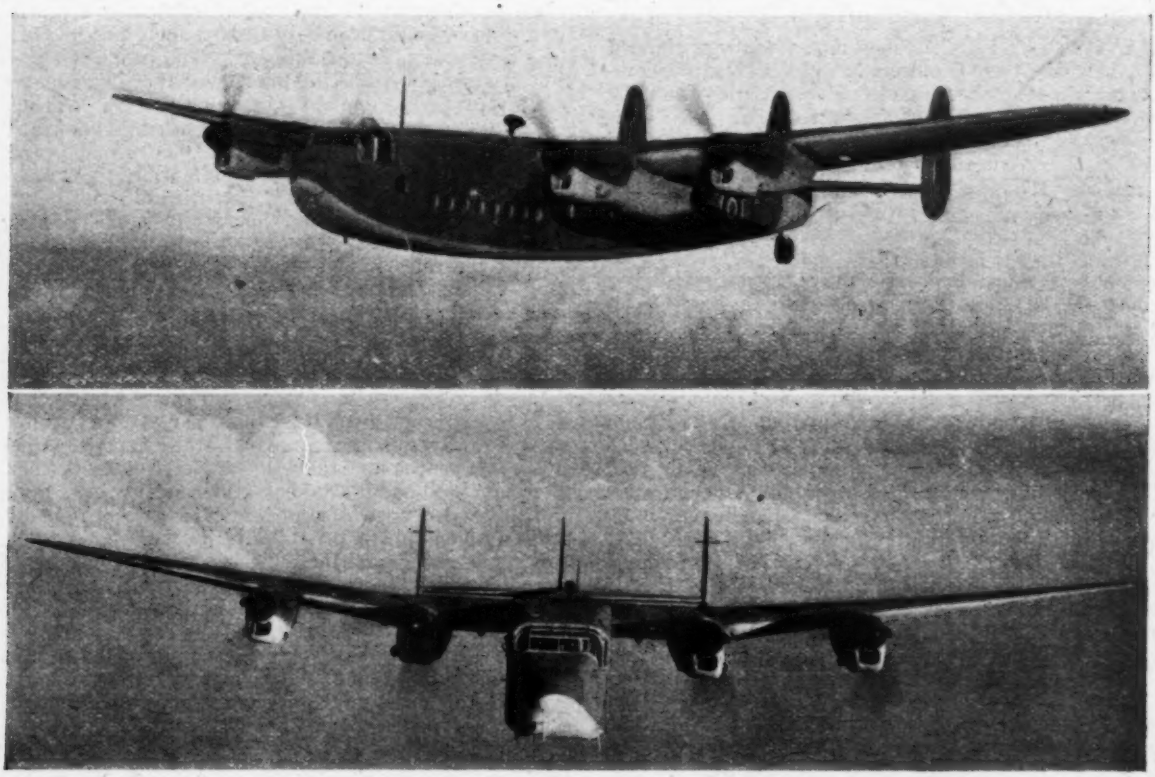
The Pacific Sea-air Battle

THE Pacific struggle is a matter of sea and air. The islands and other lands occupied by the Japanese have to be supplied by sea. The convoys are escorted tactically by cruisers, destroyers and carriers, but strategically their passage depends on the Japanese battle fleet, which is still a fleet in being. Sooner or later it will have to fight the British and American fleets for the command of the Pacific, and if it is beaten then the Allies will be able to sweep the seas.

The new air assault on Rabaul and landing on Bougainville have forced the enemy to try to reinforce, and has enabled the Allies' aircraft and warships to take further toll of Japanese cruisers and destroyers. General MacArthur has shown himself a master of air tactics and combined operations.



AERIAL WAR OF THE ROSES: Having been developed from the Lancaster we presume that the York of necessity had to be civil. These are the first air pictures of the York. Other photographs and comment appear on pages 532 and 533.

An "air to air" photograph of a Halifax II. A picture of the new Halifax tail appears on page 533.

WAR in the AIR

Aircraft and Cossacks in the Pursuit : The Expansion of U.S. Air Striking Power : Dusseldorf's 27 Minutes' Raid

ON the three occasions when British forces drove the Axis back from the frontier of Egypt across the desert of Libya, the flying enemy columns were pursued and harassed by aircraft. The pursuit of a flying enemy force was in past wars the function of horsed cavalry. There were cavalry regiments in the desert Army, but they were not mounted on chargers; they pushed ahead in tanks. But tanks were not fast enough to catch and cut up the retreating Italians and Germans, and their place was taken by light bombers and fighter-bombers. It seemed that it had been settled for good and all that aircraft were to be the cavalry of the future, so long as operations took place in suitable conditions.

The Russians, however, in their grand drive across the steppes to the north of the Crimea, have provided a new puzzle for tacticians by using both aircraft and mounted Cossacks at the same time. In previous winter advances, when either snow or mud and dirty weather overhead hampered the use of anything which depended on petrol engines, one could understand the advantage of using horsed cavalry. They could push ahead when the ground and the sky made movement by tanks and aircraft impracticable; but in the present autumn it is strange to hear of aircraft and Cossacks being employed at the same time, with a good deal more emphasis being placed on the Cossacks in the communiqués and the reports from correspondents.

Of course, the use of horses saves petrol, and no belligerent wants to use up petrol just now if equally good results can be obtained by other means. Another consideration is that horsemen can open out very quickly and so present an unsatisfactory target to enemy bombers and fighters. Perhaps a third reason for the extensive use of the Cossacks is that much of the hard fighting has been taking place in Russian villages held by the Germans, and the Russian commanders prefer not to bomb those villages if they can capture them in any other way. The Cossacks, moreover, can dismount and fight as infantry when necessary, which aircrews cannot do.

The strength of the North West African Air Forces has evidently been increased of late, and as a result two American Army Air Forces have now been formed under the command of Gen. Spaatz, namely No. 12 and No. 15. The latter is the most recent formation, and it soon made itself felt by sending a strong body of Fortresses and Liberators beyond the Alps to bomb once more the Messerschmitt assembly works at Weiner Neustadt, in Austria. They had clear weather over the target, and the raid is believed to have been very successful. To cut down the production of German fighters at the present juncture is particularly useful work, for the Germans are extremely anxious to increase their air defences, and are very short of fighters for the purpose.

At the same time, the U.S.A. Eighth Air Force in Great Britain has been giving evidence of its increased power. One day last week over 400 of its heavy bombers made the heaviest day-

WAR IN THE AIR

ENEMY AIR LOSSES TO NOV. 6th

	Over G.B.	Continent	Middle East	N.W. Africa
Oct. 31	1	2	0	2
Nov. 1	2	1	0	4
" 2	1	3	0	37
" 3	0	17	0	6
" 4	0	0	0	5
" 5	1	0	0	0
" 6	0	0	0	4
	5	23	0	58

Totals: West, 7,700; Middle East, over 5,740; North-West Africa, 3,552.

light raid of the war up to date. Wilhelmshaven was the chief target, and there is always good work to be done there. Only five American machines were missing from that raid, which is an extraordinarily small percentage of loss.

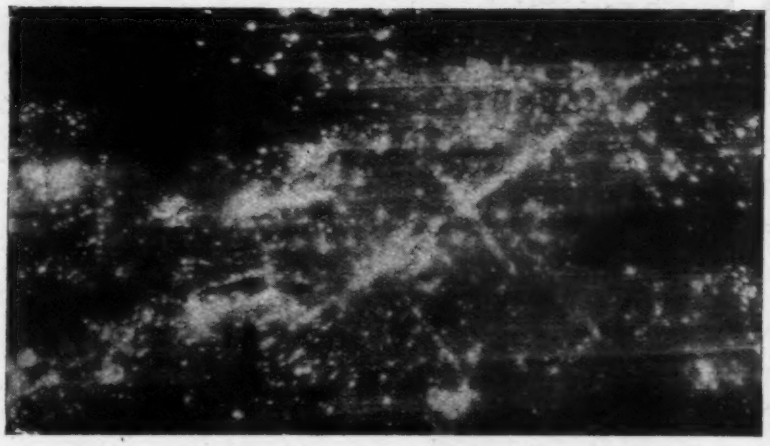
Shortly after the Americans had returned from their day raid, a strong force from Bomber Command set out for Düsseldorf. During the week there had been much November fog lying over England, but that evening there was a clear period. Those remarkable wizards, the Met. people, calculated that fog would return about midnight and settle on the British airfields, and therefore the bombers had to make haste. Concentration is always an object of Bomber Command in big raids nowadays, and this time a load of nearly 2,000 tons was dropped on the target in 27 minutes.

The Pathfinders

AT the same time other bombers raided Cologne, Mosquitoes flew over the Ruhr and the Rhineland, fighter intruders harried enemy airfields and railways, and mines were laid in enemy waters. Only 19 R.A.F. machines were missing after that night's work, and during the 24 hours 4,000 tons of bombs were unloaded on Germany and occupied territory.

All that bombing of Düsseldorf would not have been possible in the restricted time but for the preliminary work of the pathfinder aircraft. These pathfinders have been organised as a separate body since August, 1942. The crews are very carefully picked men, highly experienced and trained. They go ahead and drop special coloured flares to illuminate the boundaries of the target, and these act as guides to the less experienced crews among the bombing force. The latter do not have to waste time in searching out the target; they can go in at once and drop their bombs.

A very surprising feat by American bombers was a raid on the Andaman Islands in the Bay of Bengal by machines of Gen. Stilwell's Air Force in China. It is undoubtedly good work to bomb the Japanese in the Andamans, but one would have expected the attack to have come from India rather than from China. The very enterprising American Air Force in China had previously made more than one raid on the Japanese in Indo-China. It has shown that it has a long arm, and soon that arm may be able to reach out as far as the islands of the Japanese homeland.



ILLUMINATED BAEDEKER: The streets of Hanover on fire during the recent heavy attack by Bomber Command on that city. The broad ribbon running diagonally is the Salle Strasse.

Altogether, things are not too bright for the Japanese. Gen. MacArthur's men have landed on the two large islands in the north of the Solomons group, Choiseul and Bougainville, and there have been more destructive raids by bombers on Rabaul.

In the Rabaul area the Japanese have lost more cruisers and other vessels in an important sea-air fight with the Allies, and the result may be a really serious blow for the enemy.

An Air Ministry communiqué has recently given the latest news of a very interesting personality, namely, Wing Cdr. J. B. Nicholson, V.C. It will be remembered that the first time he went into action in the Battle of Britain his Hurricane was set on fire by an Me 110, but though the heat was blistering his hands on the gun button he shot down the enemy and then jumped with his parachute. He was the first fighter pilot to win the Victoria Cross. He is now commanding a Beaufighter squadron in Burma, which specialises in train-busting, and it has just destroyed its hundredth engine.

. . . and, furthermore, O.C. is an abbreviation of Officer Commanding—and not "old cock"!

BRITISH & U.S. AIR LOSSES TO NOV. 6th

	Over G.B. A'crft.	Continent B'brs.	Continent F'trs.	Middle East A'crft.	N.W. Africa A'crft.
Oct. 31	0	1	2	0	0
Nov. 1	0	0	1	0	2
2	0	0	1	0	6
3	0	26	4	0	2
4	0	4	0	0	1
5	0	13	6	6	1
6	0	0	2	3	0
	0	44	16	9	12

Totals: West, 8,302; Middle East, about 2,309; North-West Africa, 1,326.

News has also come to hand that French squadrons of Spitfires took part in the reconquest of Corsica. Many of the pilots are old hands, and some fought in France in the bad days of 1940, when the Armée de l'Air suffered badly from inferior equipment. But with the Spitfires they got a lot of their own back from the Germans, and in their first two days on what Henry Seton Merriman called "The Isle of Unrest," they shot down 13 German aircraft. The airfields of Corsica are within 50 miles of Italy and 100 miles of France.

Düren, the town which gave its name to duralumin, was raided again by Fortresses of the U.S. Eighth Army last Sunday, and it goes without saying that the raid was made in daylight. Thunderbolts escorted the bombers, and the only loss was one fighter. The defence was unusually weak, and the bombers were not much troubled by *flak*. Few enemy fighters eluded the Thunderbolt escort, and the gunners in the Fortresses made no claims of having shot fighters down.

HERE AND THERE

Gifts from Abroad

THE R.A.F. Benevolent Fund has received £40,000 in donations from individuals in East African territories, and a further £5,000 from gala performances of the film "Desert Victory" in Cairo and Jerusalem.

Belgian Air Transport

THE Belgian Government in London has established a branch of its Ministry of Communications to deal exclusively with air transport. These offices are at 39, Eaton Place, S.W.1, and Major Aviateur Jean Verhaegen, of the Belgian Air Force, has been appointed to take charge.

Under Way

SIR STAFFORD CRIPPS, Minister of Aircraft Production, stated in a written reply last week that he has all the information necessary in regard to the requirements of the various types of aircraft for civil use after the war.

"A start," he added, "has been made with designs for aircraft, and the matter of engines is now receiving attention. The amount of staff which can be utilised on this work is, of course, strictly limited."

D.H. War Pictures

STORIES and pictures of the wartime activities of de Havilland aircraft, Gipsy engines and airscrews are wanted by the company, who are anxious to get together a record of the part being played by their products.

It is realised that censorship might prevent some material being sent by ordinary mail, but in many cases it could be sent home by R.A.F. or other Government channels, even though it could not be published till after the war.

The collection will not by any means be confined to pictures and news dealing with modern types such as the Mosquito, for there are Dragon Rapides and other modest D.H. types which are doing useful work in various theatres of war, and often figuring in exciting incidents.

Reorganised

HIGH DUTY ALLOYS, LTD., of Slough, have changed the activities and control of their subsidiary company, Hiduminium Engineering, Ltd., and the parent company has formed a new department to continue the work formerly carried out by Hiduminium Engineering, Ltd.

Mr. J. A. Heron, formerly managing director of Hiduminium Engineering, has severed his connection with the company.

Exhaust-gas De-icer

A SUCCESSFUL application of hot exhaust gases to prevent the icing-up of wings and tail surfaces was recently reported by Mr. T. M. Girdler, chairman of Consolidated Vultee Aircraft Corporation.

"Heat exchangers" in the exhaust pipes heat air which is circulated through the leading edges of the wings and tail surfaces at a controlled temperature which is initially as high as 350 degrees F.

It has functioned perfectly in high northern latitudes, and for several months long-range Catalinas have been in production with this device installed. It is also being incorporated in the Liberator and U.S. Navy flying boats, such as the Coronado.

BUILT TO AVENGE: The Grumman Avenger, now in service with the Fleet Air Arm as the Tarpon, stows its torpedo internally, is powered by a 1,600 h.p. 14-cyl. Wright Cyclone, and has a top speed of about 260 m.p.h. Undercarriage arrangement and gun position aft of the torpedo bay are shown in this close-up which gives a good idea of the Tarpon's size. Span is 54ft. 2in., length 41ft.

WAR AND PEACE: A new A.T.C. recruiting poster (in colour) stressing, by its idea of tomorrow's aircraft, the post-war value of the training given.

Merlin-engined Mustangs

VOLUME production of the Rolls-Royce Merlin with two-speed, two-stage supercharger was begun by the Packard Motor Co. "several months ago," it was recently announced in America.

This is the Merlin now being installed in the latest Mustang (P-51) fighters which, according to a report from North American Aviation Inc., is now in quantity production at the company's Californian and Texan factories.

October Record

MR. DONALD NELSON, chairman of the U.S. War Production Board, stated recently that the American aircraft industry set up a new monthly output record in October by turning out a total of 8,326 aircraft. This figure included a record number of heavy bombers, and a proportion of the new "super bombers" (presumably the B-29 and B-32).

This new monthly total exceeds that of September by 764, and represents a slightly higher rate than the 100,000 a year set by President Roosevelt.

For Listeners' Diaries

THREE 60 min. programmes under the general title of "The Air is Our Concern," are to be broadcast by the B.B.C. on Nov. 19th, Dec. 3rd, and Dec. 17th.

The first is "Lessons from the Past," and covers the period from 1909 to 1940, the second is "Attainments of the Present" and illustrates current developments, and the third "Hopes for the Future," deals with the future of British flying and this country's part in world aviation.

Mosquito Versatility

The fighter version of the Mosquito with auxiliary long-range drop tanks beneath the wings. The 0.303in. machine guns in the nose and position of the 20mm. cannon beneath are clearly seen.

Fifteen Functions Performed by Different Versions : Speed Always the Vital Factor : Long-range and Night-fighter Types

TIME was when the R.A.F. favoured the policy of a highly specialised aircraft for each specific duty, believing that any attempt at versatility in a military type must inevitably produce a Jack-of-all-trades-master-of-none result, and in the days when almost all designs incorporated "built-in headwinds" there was a lot to be said for this argument.

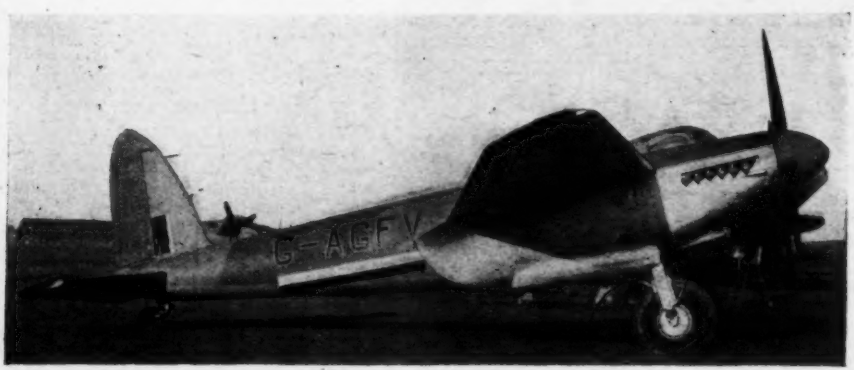
If you wanted a fighter, then speed was the *sine qua non*. And since any attempt to broaden its field of usefulness could only be at the expense of speed, then it had to remain a fighter and nothing more. It could be inferred from this that speed was not then considered to be the first essential of such types as bombers, observation and reconnaissance aircraft; other considerations came first, according to the actual duty to be performed, after which as much speed as was possible remained a desirable secondary quality.

But experience, particularly during the present war, has changed all that. More and more it came to be realised that with very few exceptions indeed speed was of paramount importance in almost every kind of military aircraft, and it was found that the fighter type, suitably modified, could fulfil a variety of duties far more effectively than many machines specifically designed to perform them. Thus we saw the slow, be-slotted and be-flapped Lysander give place to the sleek, swift Mustang for reconnaissance duties with Army Co-operation squadrons. Not that this is any reflection on the redoubtable "Lizzie"; it was designed to fulfil certain clearly laid-down requirements and it did so admirably; it is merely that the requirements have changed in the light of steadily accumulating experience. Later still, the Spitfire's speed has been found a life-saving factor in the Air/Sea Rescue Service.

A Brilliant Example

To-day one could scarcely have a more brilliant example of versatility plus really high speed than is provided by the de Havilland Mosquito, and it is no undue flattery to say that its designers—specialists in civil aircraft producing their first military type of the present war—were well to the fore in appreciating the true value of speed in all military flying operations. Indeed, one can go back to 1934 and the D.H. Comet, designed for the England-Australia race, for the first intimation of the trend of de Havilland thought in this direction. For the potentialities of the Comet, acknowledged forebear of the Mosquito, were voiced by Capt. Hubert Broad, at that time de Havilland's chief test pilot, who expressed the opinion that with a few modifications this long-distance race winner could be converted into a very useful bomber. That it already possessed the chief attribute of a fighter was self-evident.

It is now permitted to enumerate no fewer than 15 different variations of the Mosquito, eight functioning by night and seven by day, and the latest to be released for publication, that of night-fighter, provokes an interesting reflection. It is that the Germans have no adequate answer to the Mosquito as a night-bomber, nor as a night-intruder, but the Mosquito is proving one of the most effective night-fighters to deal with the nuisance raids by German fighter-bombers.

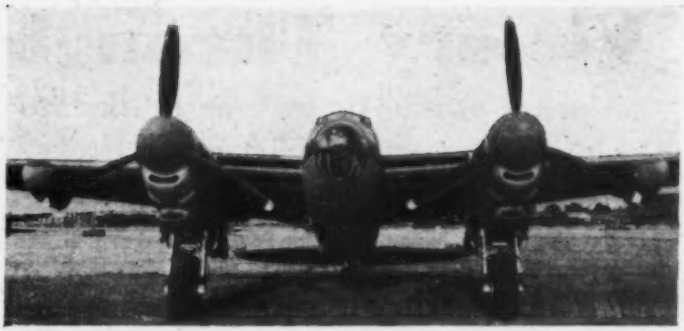


SWIFT BUT CIVIL : The normal-range transport Mosquito in service with British Overseas Airways. It can safely be described as the fastest civil aircraft in the world.

MOSQUITO VERSATILITY

Another duty being most capably fulfilled by the Mosquito is that of photographic reconnaissance, as described in *Flight* of Sept. 9th, and the P.R.U. employs two variants of the type, one for low and medium altitude photography (the former being known, with a certain grim humour, as "dicing") and another for high altitude work, which implies the use of Merlin LXI engines with two-stage, two-speed superchargers.

Yet another version of the Mosquito, the existence of which has only recently been officially disclosed, is the civil type in the service of British Overseas Airways Corporation. Strictly speaking, there are two editions of the civil, or transport model, one operating by day and the other by night, and it will be fresh in every reader's mind that the pilot and navigator of one of these civil—and therefore unarmed—Mosquitoes have been awarded the O.B.E. and M.B.E. respectively for their courage and devotion to duty over a considerable period in regularly flying between this country and Sweden in defiance of enemy fighters.



HIGH, WIDE AND HANDSOME: The leading-edge radiators are apparent in this front view of the high-altitude, long-range Mosquito used by the Photographic Reconnaissance Unit. Note the wing drop-tanks.

TIGHT TURN: Manœuvrability is demonstrated in this action picture of a normal-range Mosquito fighter.

It will perhaps now be as well to tabulate the fifteen different variations of the Mosquito, as follows:—

Fighter.
(*a*) By day, long-range oceanic patrol, *e.g.*, Bay of Biscay.
(*b*) By night, (i) Home defence interceptor.
(ii) Differently equipped, night fighter over enemy territory.

Intruder.
(*a*) Day intruder. (*b*) Night intruder.

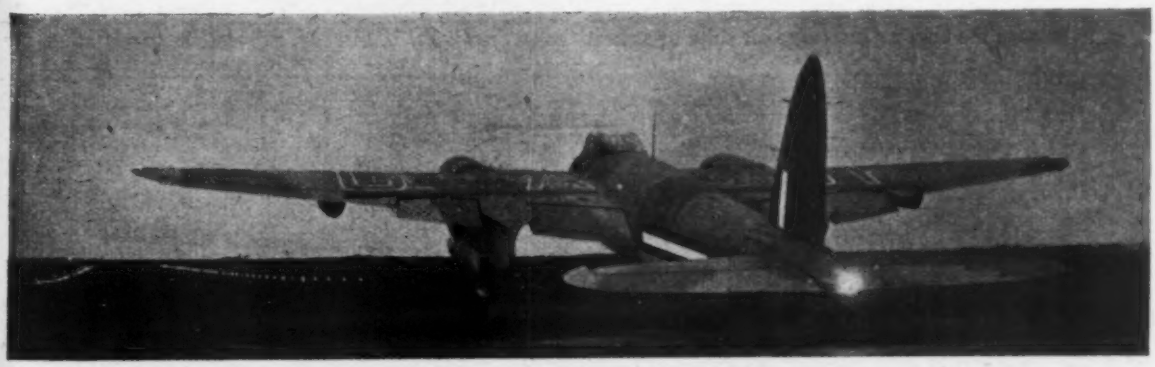
Bomber.
(*a*) By day, (i) Low attack. (ii) High attack.
(*b*) By night, (i) Low attack. (ii) High attack.

Photographic Reconnaissance.
(*a*) By day, (i) Low and medium altitude.
(ii) High altitude.
(*b*) By night (differently equipped):
(i) Low and medium altitude.
(ii) High altitude.

Transport.
(*a*) By day. (*b*) By night.

Photographs have previously been published showing long-range drop-tanks beneath the wings of bomber, P.R.U., and civil versions, but to-day we include one showing them fitted to the Mark II fighter type also.

An R.A.A.F. night-fighter squadron in Britain was among the first units to use Mosquitoes for this work, and bagged its first raider on the night of May 7th last. Since then it has made more than 400 sorties, including daylight train-busting excursions, at remarkably low cost to itself. But perhaps the most eloquent testimony to the value of speed is Bomber Command's record, for during the past six months only 11 Mosquitoes have failed to return from some 60 major raids on Germany and nearly 1,000 other sorties against the enemy's industrial centres.



LONG-DISTANCE NIGHT EXPRESS: The long-range version of the civil Mosquito in service with British Overseas Airways, with flaps partially lowered, faces up the flarepath in readiness for a nocturnal take-off.

D

Victory Through Air Power

Mastery of the Air by "Air Battleships" : Jet Propulsion Favoured : Some Thoughts Evoked by the Film

By FRANK MURPHY

IN the film under above title Major Seversky makes the statement that no country which has mastery of its own air can be invaded.

With this statement I quite agree, and its application to our own country is obvious. At the time of seeing the film, however, I was still earth-minded and interpreted the statement as meaning that no land or sea invasion was possible so long as the enemy held the supremacy of his own air. Clearly, however, the statement is a general truth; consequently no invasion of Germany is possible either by land, sea or air so long as the Germans have the mastery of their own air.

Bombing as practised at present can be regarded as an attempted invasion by air. Therefore, if Seversky's dictum be accepted, it cannot be successful.

This does not mean that the use of air power for bombing is unsound, but it may mean that it is premature. I think the first step towards successful air bombing is to destroy the enemy's air power. This cannot be done either by bombers, fighter-bombers or fighters. It can only be done by "air battleships."

THIS provocative article, to which reference was made on our leader page in last week's issue, raises several controversial subjects. For instance, no allowance is made for the fact that the fitting of very powerful armament on the "air battleship" would detract considerably from its performance. Consequently the bomber, which would be cleaned-up by having its defensive armament removed, would be faster than the "battleship," assuming both to be basically of similar type. No reference is made to anti-aircraft defence. A tight formation of "air battleships" convoying bombers would form a good target for the enemy's Flak.

The author will be familiar to many of our readers, not in connection with aviation but from his portraits in the pre-war announcements of Murphy Radio. "The man with the pipe," of course.

Thinking along these lines, I realised what common-sense titles the Royal Navy has given to its various types of warships. If a child were to ask what is a battleship, the answer is, obviously, a ship to give battle. Similarly, a cruiser is a ship that cruises, and it cruises with the object of finding the enemy's merchant ships and destroying them. Again, because a battleship is a battle-ship, and a cruiser a cruiser, no cruiser is a match for a battleship in battle.

Appropriate Titles

In air power, a fighter is a fighter, and its object is to fight the enemy in the air; but a bomber is not a fighter, nor is its primary purpose to give battle in the air. In essence the bomber is a cargo air ship, or at best an armed cargo ship. Its job is to transport the bombs.

I believe, therefore, that our first necessity is to build air battleships, and their job will be to seek out the enemy's air fighting force and destroy it. Such air battleships might reasonably be evolved from our present bombers, by dispensing with the present bomb load and utilising the carrying capacity so set free in increased fire power and armour.

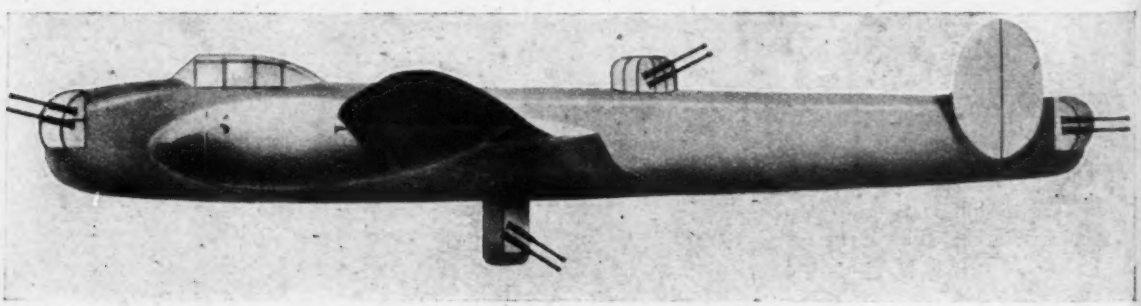
Jet-propelled Battleships

As regards means of propulsion, it would seem that jet propulsion offers greater possibilities than the conventional airscrew drive. Jet propulsion seems to offer at least two substantial advantages: silence and ability to protect much more effectively the motor plant. The former would be achieved by running the turbine and blower at such speeds that the sound waves created by them were above the audible limit. As regards the latter, it is obviously much easier to protect with armour a power plant mounted in the fuselage than it is to protect two, four or possibly eight separate engines mounted in the wings. Not only this: should the motor plant be damaged by enemy action, repairs would be more easily effected.

It might be argued that although the conception of air battleships is sound, it is too late in the day to make use of the idea, i.e., that the war would be over before an effective fleet of such air battleships could be built.

There seems to be two replies to this. First, the 1914-18 war reached a stalemate stage, and it would probably have continued indefinitely in such a condition but for the invention and large-scale use of the tank in 1918.

But although the tank proved the decisive weapon in 1918, it does not follow that it will prove so in this war. In fact, it already seems safe to say that the



A proposal for a large, heavily armed escort-fighter closely related to a bomber. This hypothetical layout was published when the escort-fighter was discussed in *Flight* in January, 1940.

VICTORY THROUGH AIR POWER

tank will become obsolete as a weapon of war; and it will become obsolete for precisely the same reason as it was decisive in 1918—the invention of a more mobile war weapon—the air battleship.

As regards the time factor, assuming each air battleship to cost £50,000, a fleet of 1,000 could be built for £50 million, or, say, the British cost of three to four days' war effort.

Naturally, however, the whole war effort could not be diverted to building air battleships, but an allocation of 1 per cent. of our war effort would build such a fleet in twelve months.

Assuming such a fleet to be available in twelve months' time, what would be its instructions? They would be simple. Its instructions would be to seek out the enemy's air force and destroy it.

Naturally, it would be necessary to assume that the Germans were either standing still or advancing in their conception of air power. There would, therefore, appear to be three possibilities:

(1) that the enemy had stood still and that in consequence our air battleships found themselves faced with "fighters," having a speed superiority of possibly 100 m.p.h. In this case the German fighters could either rise and attack our air battleships, in which event their fighters would certainly be destroyed in just the same way as fast naval destroyers would be sunk if they dared to come within range of naval battleships. Alternatively, the fighters could use their speed to keep out of the range of the air battleships' guns. If they chose this course, then on our next trip our air battleships would escort our bombers, and these, under the protection of the battleships, would blast the enemy airfields to smithereens. So whether the fighters chose to fight, to run away, or to remain grounded, the air battleships would destroy them.

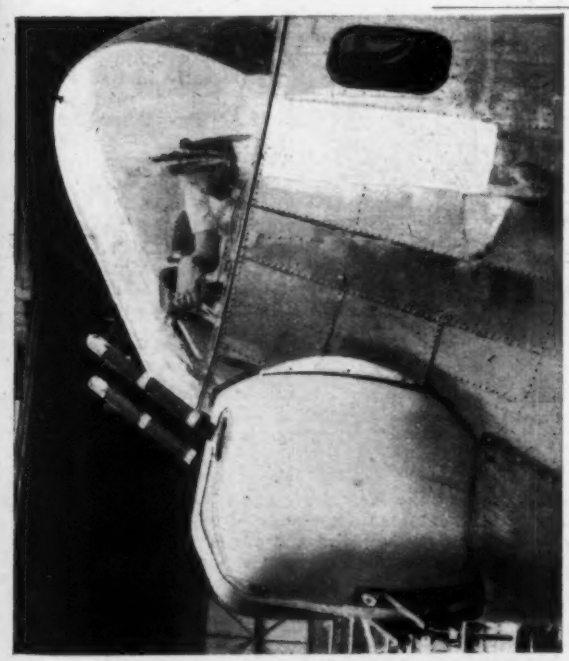
(2) That the enemy had chosen to develop as fully as possible the bomber-cum-fighter type. This, however (assuming equally competent aircraft brains on both sides) would not avail him, because every ton of bomb load would mean one ton less of armour or fire power, and the ship which was all fire power would destroy the one which had diverted some of its load capacity to bomb-carrying; that is, assuming both ships to be handled with equal military skill.

(3) That the enemy had also developed an air battleship fleet. In this case, victory would go to the side which not only possessed the freer minds, but whose country allowed the greatest freedom to use them. It is from such minds and under such conditions that the greatest technical progress is made. Assuming that we possess such minds, and that we give the greater freedom to use them (which we shall if we are true to ourselves) then victory in the air would be ours.

So, provided we are true to ourselves, whichever policy the Germans adopt, mastery of the German air will inevitably be ours. Once mastery of the German air is ours, our bombers can go over and do their work unmolested and in daylight.

To sum up, history seems to show that no nation has ever been defeated so long as its fighting force is intact. In 1943, the fighting force is the air force, since no fighting force which has only two-dimensional mobility can compete with one having mobility in three dimensions.

Finally, I would claim that the first nation to become truly air-minded will win the war. At present we are not so minded. Even our long-range bombing is in essence a land artillery conception, i.e., a long-range gun. Fortunately for us, our enemies, too, are still earth-bound in their conceptions.



The new twin .5in. machine-gun "chin" turret on the Flying Fortress is to help ward off head-on attacks. On our night bombers the tendency is to cut down the front armament.

BATTLE DRESS FOR THE R.A.F.

WAR service dress, consisting of a blue blouse and trousers, similar to khaki battle dress, is to be introduced as the standard working dress for all ranks of the Royal Air Force. Collars and ties will be worn with the new dress by officers, warrant officers, and N.C.O.s of the rank of sergeant and above.

Issues to officers will be made on repayment and on the surrender of 20 clothing coupons: supplies will be available from Service sources only and not from trade sources. The wearing of uniform of this pattern made from material other than the standard serge is forbidden.

In the first instance war service dress will be issued to air crews and as supplies become available its use will be extended throughout the Air Force except in the case of the R.A.F. Regiment, which will continue to make use of the khaki.

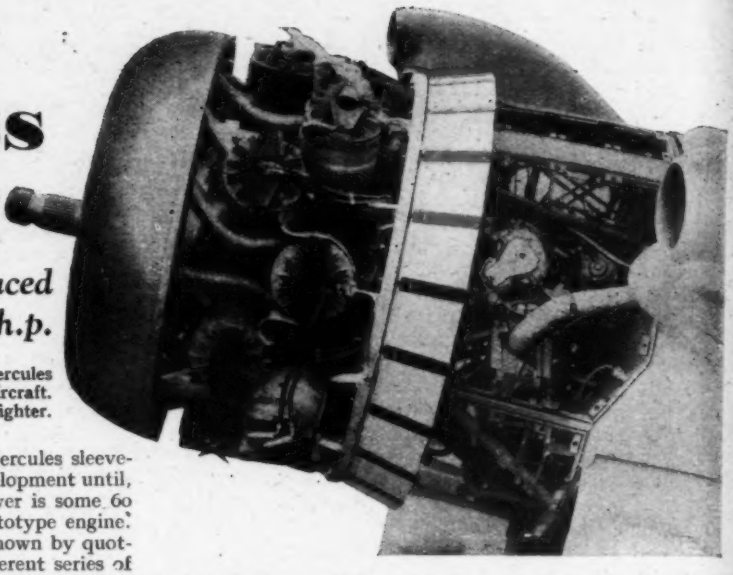
A.T.A. BENEVOLENT FUND

FURTHER donations to the above fund are listed below. They bring the grand total to over £11,000 to the end of October.

	£	s.	d.
Donations already acknowledged	8,330	19	1
Subscriptions by members of A.T.A. and B.O.A.C.	2,775	17	7
International Combustion, Ltd., Raid Spotters' Club (No. 167), Derby	30	0	0
Serck Radiators, Ltd.	5	5	0
Successors to Smith's Forgings Co., Ltd.	5	5	0
R. Hipkiss and Co., Ltd.	5	0	0
Charles Weston and Co., Ltd.	4	4	0
Employees of F. Hill's Flight Shed, Barton Airport	4	4	0
R. M. Myers	2	0	0
R. J. Brookes	1	1	0
Mrs. S. Petersen		10	0
	£11,164	5	8

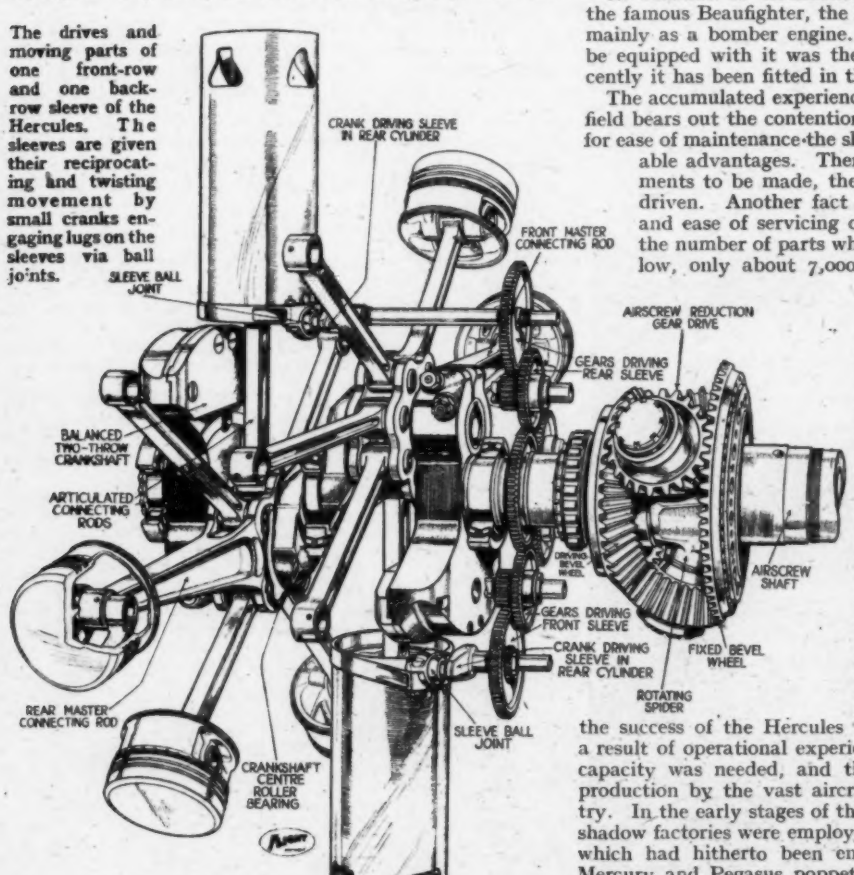
Hercules Progress

Power of Bristol Sleeve-valve Engine Increased by 60 per Cent.: Specific Weight Reduced from 1.29 lb./h.p. to 1.12 lb./h.p.



Simplicity is the keynote not only of the Hercules engine itself but of its installation in the aircraft. This picture shows it in a Bristol Beaufighter.

FIRST introduced in 1936, the Bristol Hercules sleeve-valve engine has undergone steady development until, at the present time, its maximum power is some 60 per cent. greater than the power of the prototype engine. More specifically the development may be shown by quoting the maximum power figures for the different series of Hercules engines. The prototype developed 1,290 h.p. for a weight of 1,665 lb., or 1.29 lb./h.p. The series II developed 1,325 h.p.; the series IV 1,380 h.p.; the series XI 1,560 h.p.; the series XVI 1,635 h.p.; the XVII over 1,650 h.p. The specific weight of the series XVII is 1.12 lb./h.p., a very remarkable reduction compared with the 1936 prototype. Bristol engineers are confident that the limit has not yet been reached and that the Hercules is capable of even further development.



The drives and moving parts of one front-row and one back-row sleeve of the Hercules. The sleeves are given their reciprocating and twisting movement by small cranks engaging lugs on the sleeves via ball joints.

Large-scale Manufacture

In addition to installation in Bristol aircraft, notably the famous Beaufighter, the Hercules is used in the R.A.F. mainly as a bomber engine. One of the first bombers to be equipped with it was the Short Stirling, but more recently it has been fitted in the Avro Lancaster II.

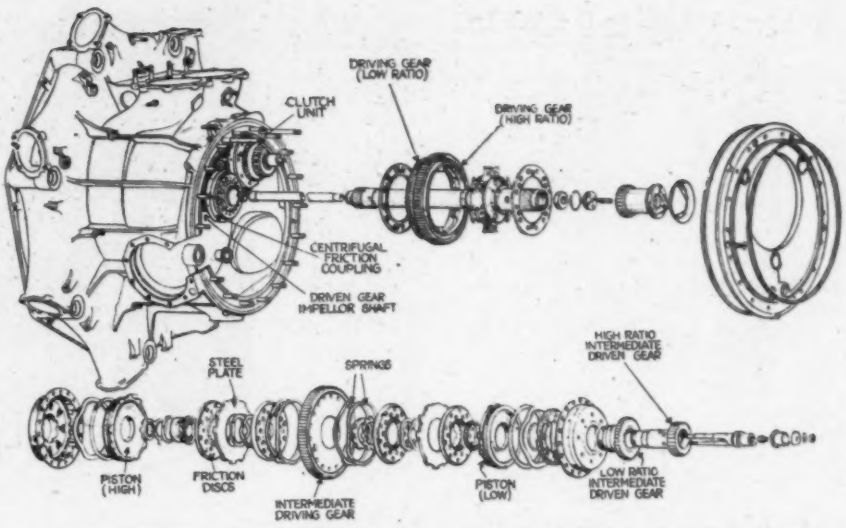
The accumulated experience which has been gained in the field bears out the contention of the Bristol Company that for ease of maintenance the sleeve-valve engine has considerable advantages. There are no valve tappet adjustments to be made, the sleeves being gear-and-crank driven. Another fact which adds to the reliability and ease of servicing of the Hercules engine is that the number of parts which can go wrong is extremely low, only about 7,000 all told, and of these only 1,000 parts are different.

Quite early in the war, in the spring of 1940 to be precise, the Air Ministry commissioned the Bristol Aeroplane Company, Ltd., to build, equip, staff and manage a new factory devoted to large-scale production of Hercules engines. In spite of difficulties such as the need for training local labour, largely female, the first engine was produced before the end of 1940. Since those days production has increased very greatly, and this factory is now producing 60 per cent. more engines than the original estimate of the factory's capacity. When the success of the Hercules became firmly established as a result of operational experience, even greater production capacity was needed, and the engine was scheduled for production by the vast aircraft engine "shadow" industry. In the early stages of this production other new main shadow factories were employed, while other main factories which had hitherto been engaged on machining Bristol Mercury and Pegasus poppet-valve engines were changed over to Hercules production. Not only so, but a multitude of small general engineering firms up and down the country were found capable of undertaking work on Her-

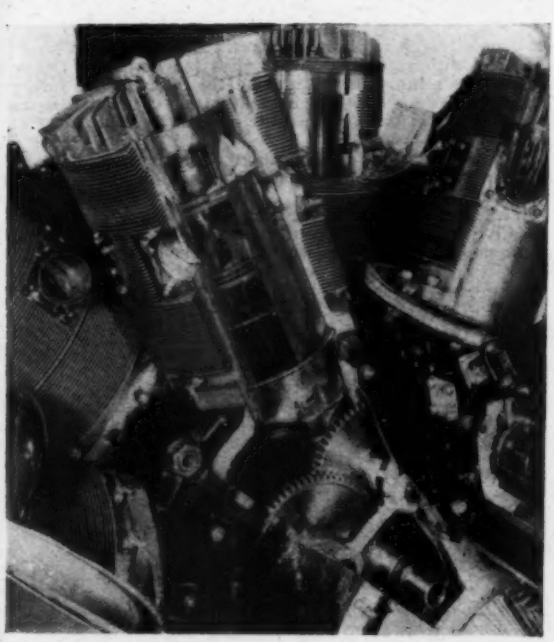
cules parts, so that by now there is scarcely a town in the country which is not in this way making its contribution to the equipment of the R.A.F.

During a recent visit to the Bristol parent factory we had an opportunity to discuss with Mr. N. Rowbotham, chief engineer of the Bristol engine division, the quality of the engines produced "outside." He was eloquent in his praise of the work being done, and said that the engines built by these firms were in every way as good as those built by the parent company and indistinguishable from them in the matter of performance and reliability. That is high praise indeed and deserves to be specially noted.

So far as the features and operation of the Hercules sleeve-valve engine are concerned, they will be familiar to most of our readers, a detailed description by Mr. G. Geoffrey Smith having been published with special perspective illustrations two years ago, in our issue of November 27th, 1941, to be precise. Some of the main points of the design may, however, be recalled for the benefit of those readers who did not have an opportunity to see the original article. Before doing so it is of interest to state that for the instruction of the R.A.F. the Bristol Company has had a Hercules engine sectioned, and most beautifully it has been done. The working of a sleeve valve, with its combined reciprocating and twisting movement, timed to function in conjunction with the reciprocating piston, is none too easy to visualise, and the sectioned engine, driven slowly by an electric motor, affords an excellent demonstration of the operations which are taking place simultaneously. Coloured lights inside the cylinders are used to indicate the four strokes: induction, compression, firing and exhausting. A sketch by Mr. M. A. Millar, reproduced herewith, explains how the sleeves of the Hercules are driven.



An exploded view of the two-speed supercharger drive of the Bristol Hercules. Different ratios are available according to the type of engine, typical ratios being 6.39 and 8.75 for one engine, 8.15 and 9.49 for another.



A Hercules engine has been sectioned for instructional purposes to show the simultaneous movements of the sleeve and piston. Mechanically they are simple, but somewhat difficult to visualise. Coloured electric lights inside the cylinders show the four strokes: induction, compression, firing and exhaust.

Features which help to make the Bristol Hercules one of the simplest high-power aircraft engines in existence are:—

The radial construction which permits the use of individual cylinder assemblies, simple to manufacture, handle, service and replace.

Air cooling with its absence of complications.

The Bristol single-sleeve valve system of operation. This replaces the multitude of parts comprising the conventional poppet valve gear by the Bristol single-sleeve valve with its smooth sliding continuous motion.

Chief Design Features

The 14 cylinders, of 5¾in. bore and 6½in. stroke, give a total capacity of 2,360 cubic inches (38.7 litres) and are arranged radially in two rows around the forged light alloy crankcase, the rear row being staggered in relation to the front row. Both the high-conductivity light-alloy detachable head and the barrel, with its deep close-pitch finning, are scientifically arranged to provide the most efficient use of the cooling air. The two-throw crankshaft, with its special torsional and flexural vibration eliminators, is built up in three sections enabling one-piece master rods to be used, the articulated rods being connected to the master rods by wrist pins in accordance with standard Bristol practice. The wrist pins are so positioned as to provide

BRISTOL HERCULES ENGINE

Type: 14-cyl. double-row air-cooled radial.	
Bore	5.75in. (146 mm.)
Stroke	6.5in. (165 mm.)
Cubic capacity per cyl.	168.6 cu. in. (2,764 c.c.)
Total cubic capacity	2,360 cu. in. (38.7 litres)
Overall diameter	52in. (1.32 m.)
Airscrew reduction gear ratio	0.44 to 1
Maximum power	1,680 b.h.p.
Nett Weight	1,890 lb.
Specific weight	1.12 lb./h.p.

HERCULES DEVELOPMENT

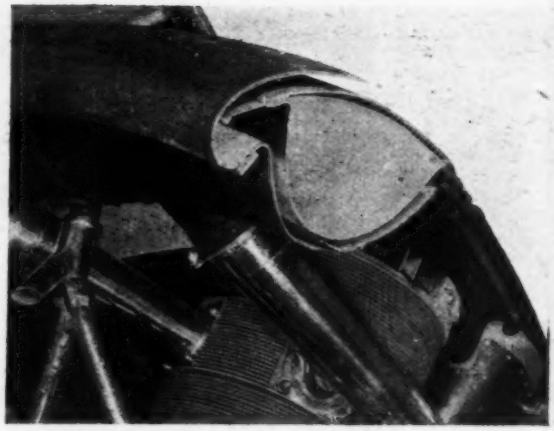
interchangeable articulated rods and uniform compression ratios.

Of special steel, the sleeve valve, with its four ports, is positively driven from the crankshaft at half engine speed by an arrangement of simple cranks and gears. This single sleeve has the further advantage that the designed valve timing is maintained throughout its life, without the need of the usual regular checking and servicing of valve clearances, etc.

The excellent breathing characteristics of the single-sleeve valve, due to the relatively large area available for porting and resulting high volumetric efficiency and good scavenging, ensures the maximum results being obtained from the highly efficient Bristol centrifugal supercharger built into the rear of the engine and driven from the crankshaft rear end. This supercharger is of the two-speed type providing in low gear the maximum of power for take-off and initial climb, and in high gear sustained power output to the higher operational altitudes.

Power is transmitted to the airscrew through a bevel epicyclic reduction gear of 0.44 ratio, arranged concentric with the crankshaft on the front of the engine. Provision is made for constant-speed multi-blade airscrews of the hydromatic or electrically controlled type.

Essential accessories such as the magnetos, oil and petrol pumps are arranged on the rear cover and driven directly from the engine. In addition a power drive is provided, through the medium of a gear box, for the many and varied aircraft accessories now called for on modern machines. This arrangement not only provides the aircraft designer with greater freedom in his choice of accessories, but greatly simplifies service and maintenance in the field, both of engines and accessories.



The quiet running of the Hercules sleeve-valve engine is supplemented by the Bristol exhaust system, in which the actual exhaust ring is cooled by the air stream between the ring and the exhaust shroud, here shown sectioned.

Further to simplify installation, the engine can be supplied as a complete self-contained, cowled, and cooled power unit, with flame-damped exhaust system and with engine mounting designed for quick 4-point connection to the airframe.

U.S. POST OFFICE AIR MAIL PROFITS

A RECORD profit of approximately $33,000,000 was realised by the U.S. Post Office Department from the domestic air mail service in the past fiscal year, it is revealed in *American Aviation*. Only ten years ago, in fiscal year 1933, the domestic air mail system was more than $13,000,000 "in the red." In fiscal year 1942 the Post Office profit on air mail was $7,500,000.

Revenue received by the Post Office from air mail postage in the year ended June 30, 1943, totalled $60,485,434. During the same period, payments to airlines were $24,588,115, putting revenues $35,897,319 ahead of payments.

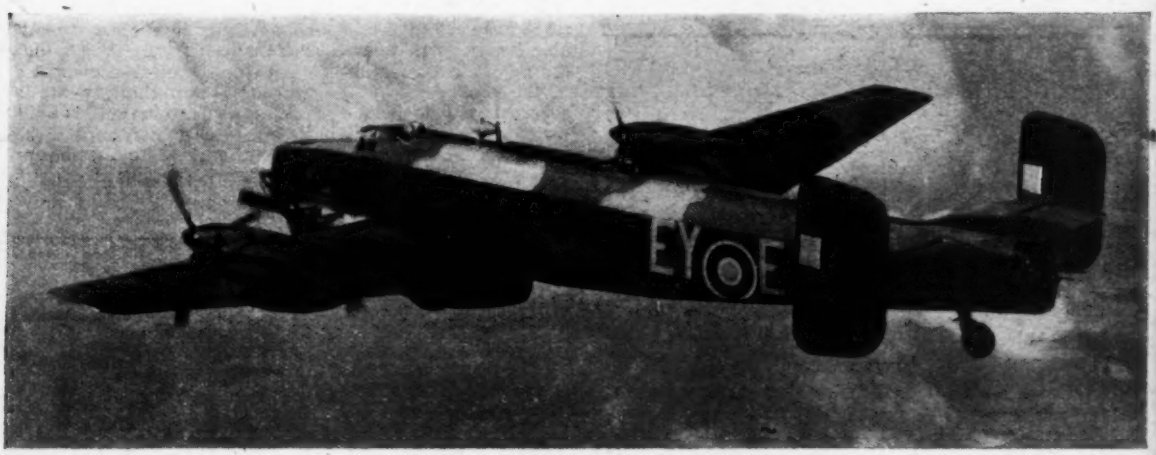
In addition to payments to the airlines, however, the Post Office has certain direct expenses, such as air mail field post offices, railway mail service, etc., which generally run between $2,000,000 and $3,000,000. Thus, the profit to the Post Office on the air mail service, after these direct expenses, was approximately $33,000,000.

The $24,588,115 figure for payments to the airlines is not yet final because of Civil Aeronautics Board mail rate proceedings not yet settled. However, even if the Board grants some retroactive increases, it is not anticipated that the total figure for the year will be much more than $24,588,115.

There is every indication that the Post Office profit in the present fiscal year (1944) will exceed even that shown in 1943. For instance, revenues in July of this year were 75 per cent. greater than in the same month last year. This increase is even more surprising when it is realised that the airlines are operating with about one-half of their pre-war fleet of transports. The return of 13 planes by the Army to the airlines recently broke some of the air mail bottlenecks, but it is said that at least six more planes are needed to insure adequate movement of the mail.

With the country's airlines short of equipment and taxed to the utmost to carry war-essential traffic and express, air mail has suffered accordingly.

In a recent speech in Boston, L. Welch Pogue, chairman of the Civil Aeronautics Board, revealed that approximately 10,000,000 air mail letters were being delayed every week.



A NEW TAIL. With its new fins and rudders the Handley Page Halifax II has a distinctly "Mitchell" appearance at the back end. The modification has improved the flying qualities considerably.

SELF-SEALING COUPLINGS

For use in aircraft and other hydraulic piping systems

Lockheed-Avery couplings can be uncoupled and recoupled without loss of fluid or entry of air, whether under pressure or not.

They are therefore most valuable in simplifying overhauls and for sectional assembly.

Suitable for fuels, coolants, lubricants or hydraulic fluids.

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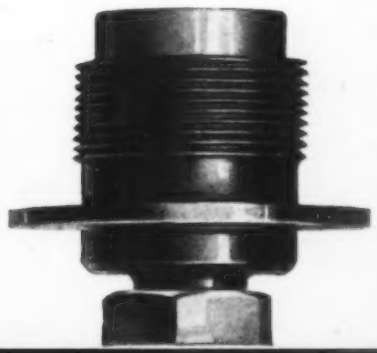


LOCKHEED AVERY

Seventy-fourth of the Current Recognition Series

Aircraft Types and

INVADER (A-36)

FIRST news of the Invader, known to the U.S.A.A.F. as the A-36, came at the time of the fighting in Sicily. It is, as is now well known, the fighter-dive-bomber version of the North American Mustang, and it would appear that this excellent American aircraft, widely regarded as one of the most successful fighter types the U.S. has so far produced, bids fair to compete with the Hurricane in the matter of versatility.

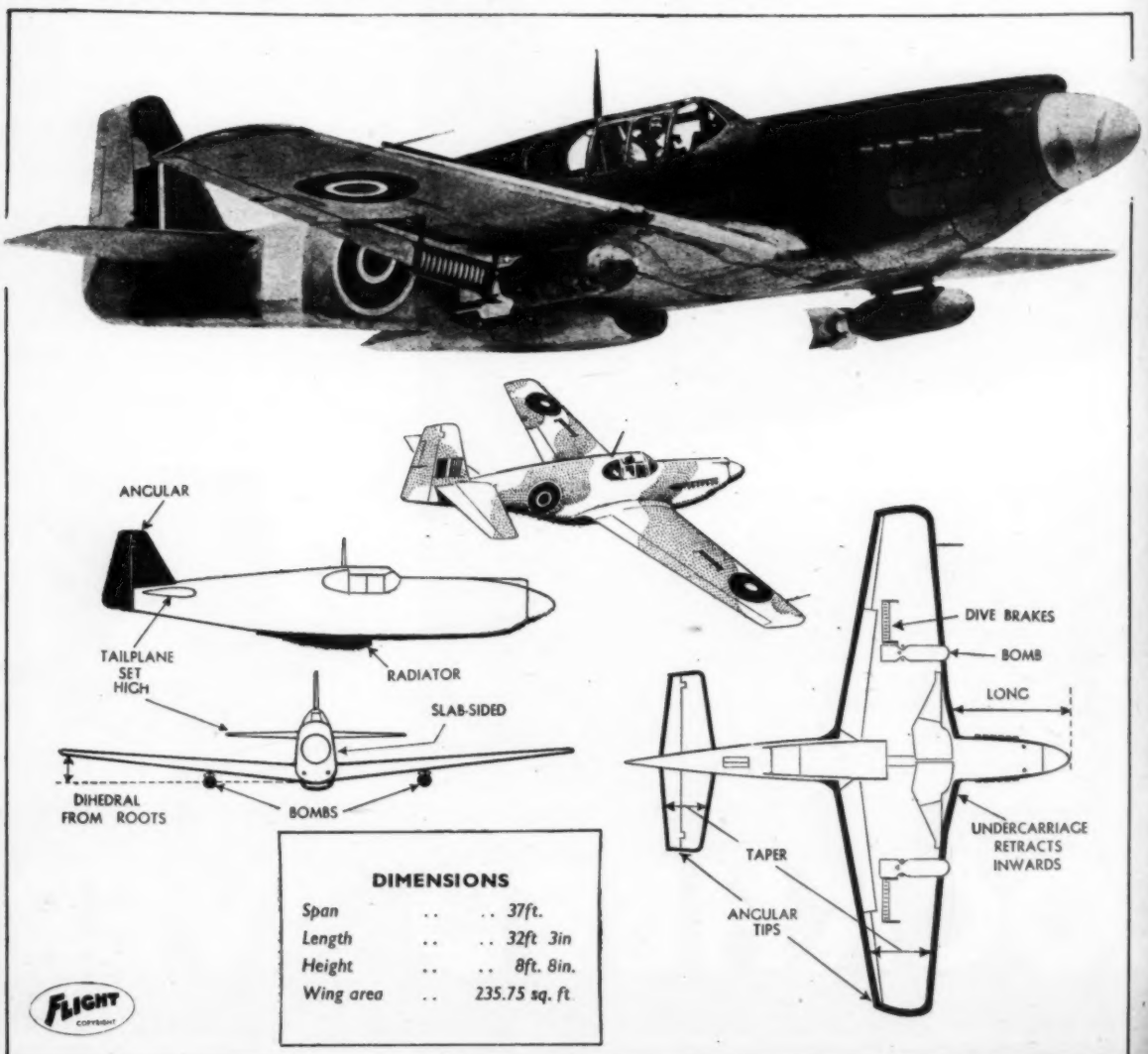
It is probable that the airframe of the Mustang has undergone some stiffening to fit it for the extra loads which it would have to withstand as the Invader, but, apart from that, the only visible modifications are the provision of bomb-racks beneath the wings, and dive brakes.

The bomb-racks, which normally carry two 500 lb. bombs, take the place of the two outer machine-guns of the Mustang version, while the dive brakes are similar to those of the Vultee Vengeance dive-bomber. They are fitted above and below the wings outboard of the bomb-racks and are of the slotted type, the slots being vertical when in the operating position. When closed in normal flight, they lie in recesses flush with the wing surfaces, but they are still visible and, when the machine is seen from above, provide the only quick and sure means of distinguishing between a Mustang and an Invader.

Only the Allison-engined Mustang, with a top speed of about 350 m.p.h., has, so far, been modified into Invader form, but it is fairly safe to hazard a guess that when the Merlin-engined version is sufficiently advanced in terms of quantity production, this very much "hotter" edition will also begin to appear as (possibly) the Invader II.

Armament of the Invader, in addition to its bomb-load, comprises two 0.5in. machine-guns firing from blast tubes under the nose and synchronised to miss the airscrew, and four machine-guns in the wings firing outside the airscrew disc. The wing guns may be either 0.5in. or 0.303in. Incidentally, although primarily intended to be a fighter-dive-bomber, the Invader remains a sufficiently good fighter to take on escort duties in the Italian theatre and has been successfully employed as such.

Other recognition features of the Invader include wings and tailplane which have a straight taper on both edges and square tips, a radiator beneath the fuselage amidships, angular, but symmetrical fin and rudder, and long, slim, oval-sectioned fuselage.

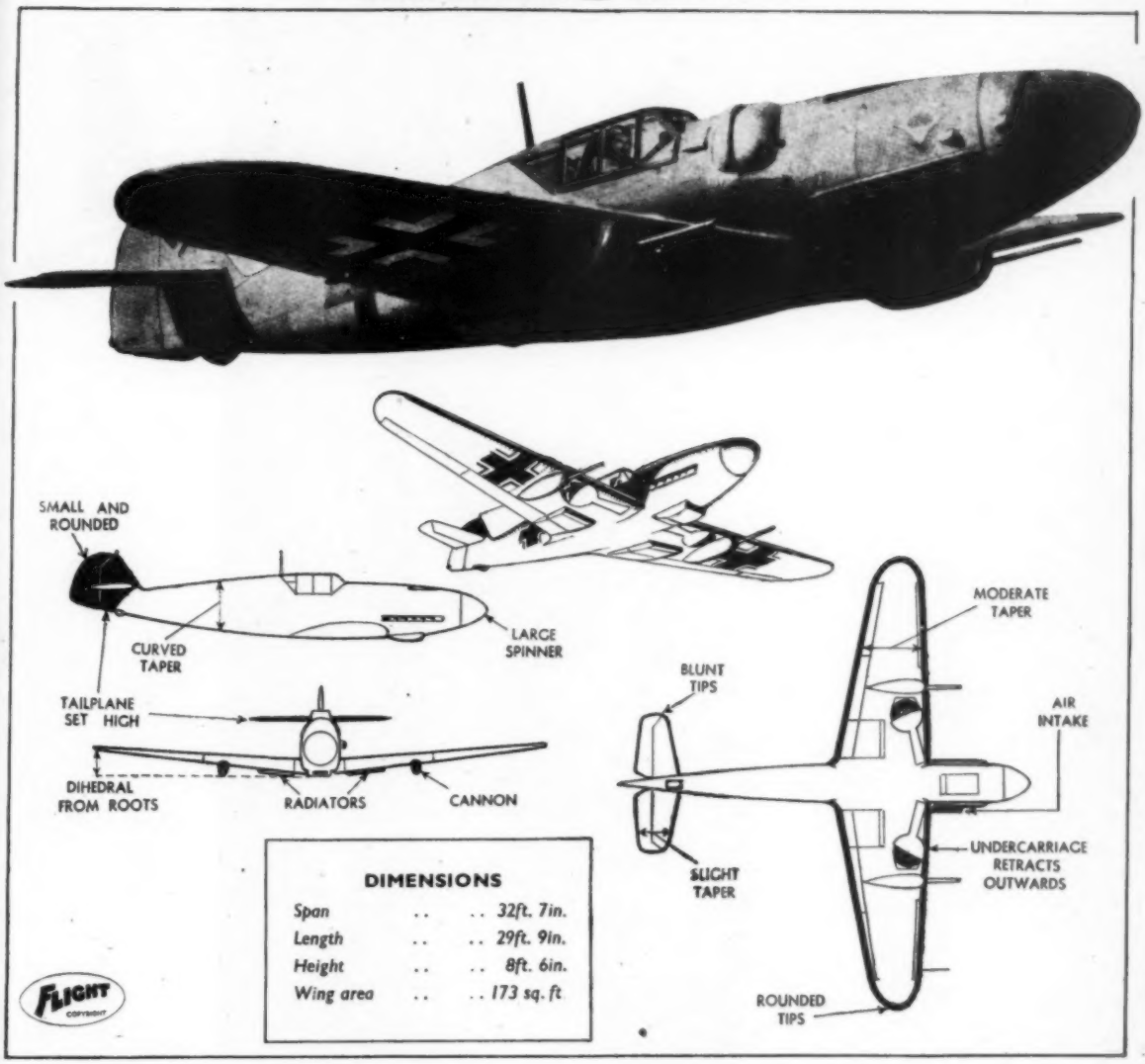


DIMENSIONS

Span	.. ..	*37ft.*
Length	.. ..	*32ft 3in*
Height	.. ..	*8ft. 8in.*
Wing area	..	*235.75 sq. ft*

...heir Characteristics

MESSERSCHMITT ME 109G



DIMENSIONS

Span	*32ft. 7in.*
Length	*29ft. 9in.*
Height	*8ft. 6in.*
Wing area	*173 sq. ft*

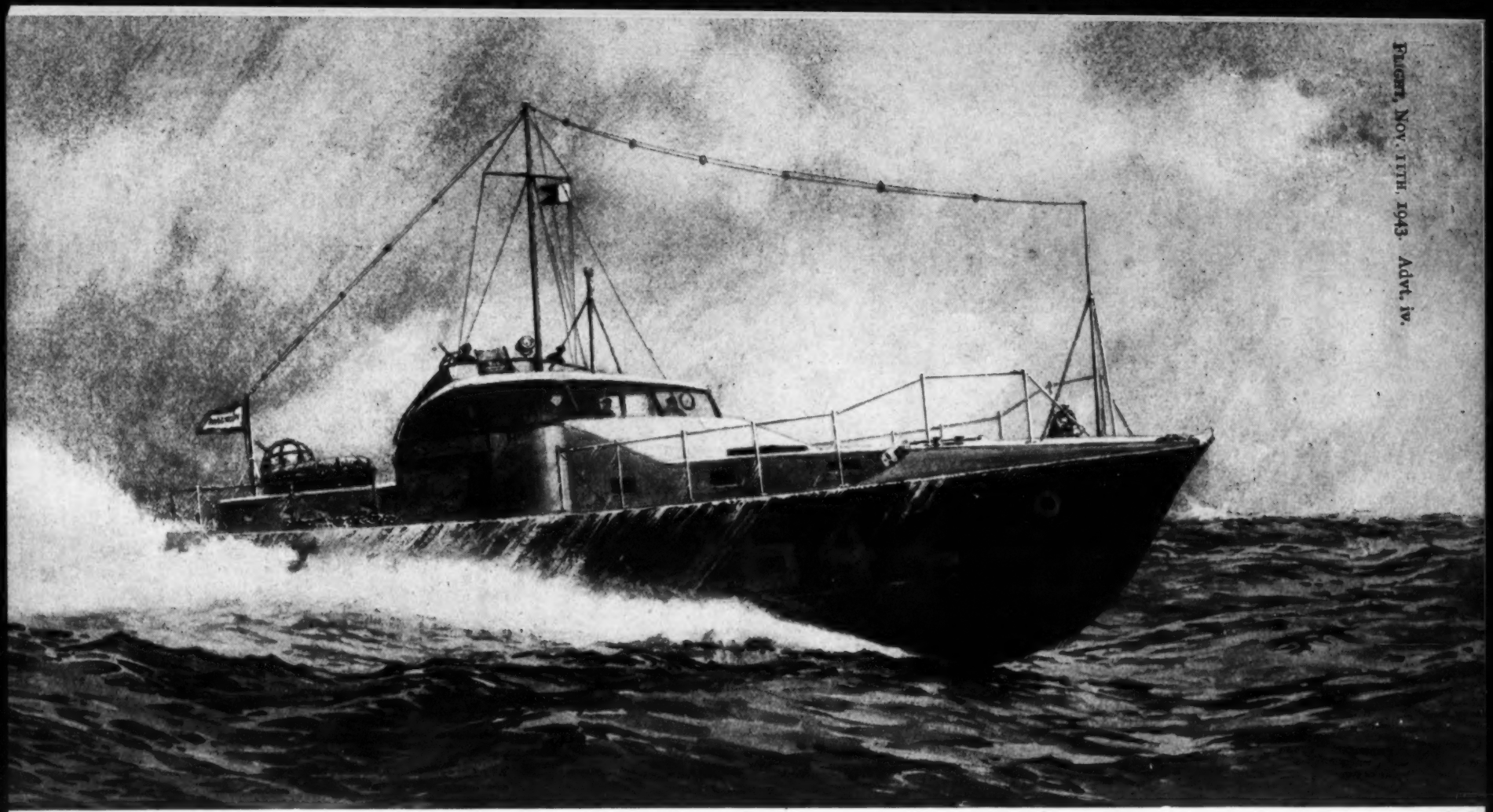
IN spite of the advent of the Focke-Wulf Fw 190 single-seater fighter, the Messerschmitt Me 109, of which the "G" series is the latest development, still remains the standard equipment of many *Luftwaffe* fighter squadrons.

When the present war began the Me 109E was in service in considerable numbers, but the acid test of actual combat soon proved that its general performance was inferior to that of the Spitfire, and this was driven home to the Germans so emphatically during the Battle of Britain that they set about trying to improve what was at that time their best in the way of single-seater fighters.

With this object in view they "cleaned up" the airframe by fitting a cantilever tailplane in place of the strut-braced one, redesigned the wings with rounded tips, and modified the lines of the cockpit cover and the cowling—all of which materially reduced the drag. They also fitted the then available Mercedes Benz DB 601E engine in place of the DB 601A, and scrapped the two wing cannon in favour of a single cannon firing through the airscrew hub. Ceiling and manœuvrability were improved and there was an increase in speed of some 20 m.p.h., the modified type being known as the Me 109F.

The latest version, the Me 109G, was first reported in action on the Russian front, and it is now in service in a variety of forms, though all of them have in common the new DB 605 engine. This is a direct development of the DB 601 series and develops 1,500 h.p. at 16,400ft., with a maximum of 1,350 h.p. for take-off. The older DB 601 engine was rated at 1,200 h.p. The new engine still conforms to the same general design and is a 12-cylinder, liquid-cooled, inverted-Vee type, with direct fuel injection.

Armament of the Me 109G series, many of which were destroyed and captured in the Mediterranean theatre (notably in North Africa and Sicily), varies considerably. Some have the same gun equipment as the Me 109F, but the general arrangement appears to be two extra 20 mm. cannon carried under the wings in fairings similar to those of the Hurricane "tank-buster" and 13 mm. machine-guns in the cowling (synchronised to fire through the airscrew disc) instead of the 7.9 mm. guns. Some Me 109Gs retain the Mauser cannon firing through the hollow airscrew hub, but on others it is omitted. Otherwise the Me 109G is externally similar to the 109F, its top speed being about 385 m.p.h.



THE WALTON YACHT WORKS LIMITED

FLIGHT, NOV. 11TH, 1943. Advt. iv.

Behind the Lines

Service and Industrial News from the Inside of Axis and Enemy-occupied Countries

Sauve Qui Peut

A BERLIN report reaching Reuter via Stockholm says that the German High Command is considering a complaint that Field Marshal Kesselring used *Luftwaffe* lorries and petrol to evacuate his family from Berlin. The High Command is to decide what action should be taken against him.

Promoted

RECENT reports of the *Luftwaffe* include the promotion of Major Generals Kettner, Brunner, Behrendt, Krahmer and Maelzer to the rank of Lt. General, and the names of 17 Colonels who have been advanced to the rank of Major General.

Sparkling Hermann

YET another spangle will appear on the overcrowded chest of Hermann Goering: Vice-Admiral Abe and Major General Komatsu, the Japanese Military and Air Attaché in Berlin, presented him, on behalf of the Emperor, with the Insignia of the Great Cross of Palovina Order.

Consolation Prize

AS in the past year, so this year on October 15th, flying personnel of the *Luftwaffe* as well as members of other arms, received a present from the Fuehrer when they came home sick, wounded or on leave. Their identity papers were specially marked to qualify them for the gift, which consisted of a food parcel, or of a special ration card plus the amount of 10 Rm. in cash.

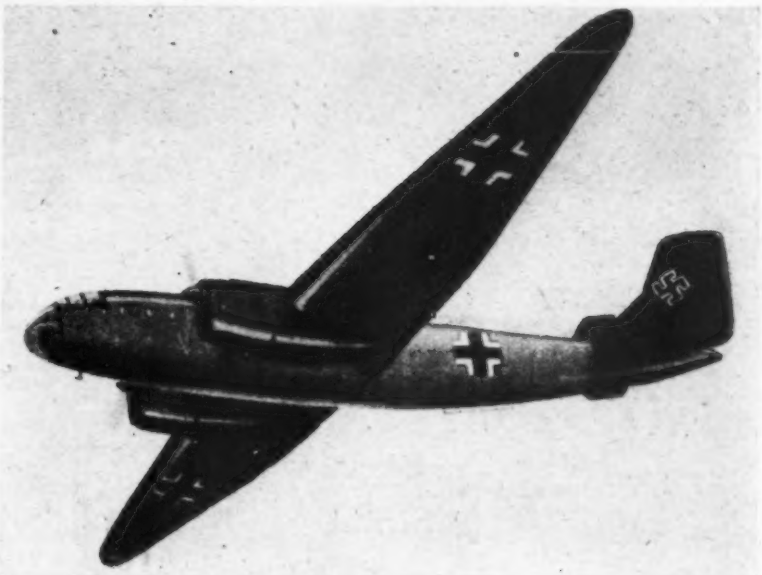
An official announcement warned that these food parcels are given only once, and that their receipt is to be noted in the identity papers.

From France

FURTHER details of the expansion of the *S.A. de Constructions Aeronautiques Morane-Saulnier* of Puteaux, near Paris, previously referred to in these columns, are now available. Michel Détroyat, the well-known test pilot, has joined the company's board of directors, while the controlling interest is still retained by Raymond Saulnier, one of its original founders. The Morane-Saulnier have recently amalgamated with the *Köllner-Béchereau S.A.* of Billancourt, M. Kellner having been executed "for undisclosed reasons."

The important plant at Tarbes, Pyrénées, previously owned by the *S.N.C.A. du Midi* and manufacturing Dewoitine types, is at present operated by the Morane-Saulnier company and it is reported that an agreement has been concluded with the Vichy Government for the purchase of the plant at a cost of 1,000,000 francs, payable in several annual instalments.

As reported in *Flight*, September 30th, 1943 (French Aircraft Industry) the Tarbes works are engaged, under the supervision of M. Gauthier, on the development of a trainer based on the single-seater fighter Morane 460 and the Morane 450 racing aircraft.



The Ju 86 P high-altitude aircraft equipped with a pressure cabin has a max. ceiling of 45,000ft. and is powered with two Junkers Jumo 207A turbo-supercharged Diesels of 1,000 h.p. for take-off. Two versions are in service: the Ju 86 P1 carrying a bomb load of 2,200 lb. and the Ju 86 P2 reconnaissance type with three cameras. Span is 103ft., length 53ft.

Happy Landings

THE development of acoustic landing altimeters based on the principle of the acoustic echo sounding method in water is attracting considerable attention in Germany. The *"Wehrtechnische Studien"* gave recently some indication as to the requirements of this instrument.

The measuring range should overlap upwards with the barometric altimeters and remain effective downwards until the aircraft touches down; undelayed reading may contain errors of not more than 19.7in. at altitudes of less than 16ft. and of not more than 10 per cent. between 16ft. and 165ft. flying altitude; the working method of the instrument must remain unaffected by the nature of the ground, meteorological conditions and flying altitude and speed.

The signal used for the soundings must be clearly distinguishable from interfering noises, preference to be given to a pure frequency, if possible outside the range of parasite frequencies. The choice of the transmitting frequency will naturally depend on the transmitter's efficiency, the distribution of parasite frequencies, the directional concentration of the sound energy and on the reflective properties of the ground.

Compressed air whistle or siren is recommended as the best means of signalling, the condition being that the signal attains maximum value of energy as rapidly as possible and drops to zero equally rapidly; experiments having shown the most favourable frequency values to be between 2,000 and 3,000 cycles/sec.

To reduce with decreasing altitude the error of indication caused by delay, the time interlude between two successive soundings must be as small as possible.

Finally, the indicating instrument must be calibrated and controlled by a time-measuring unit of adequate accuracy.

Apprehension

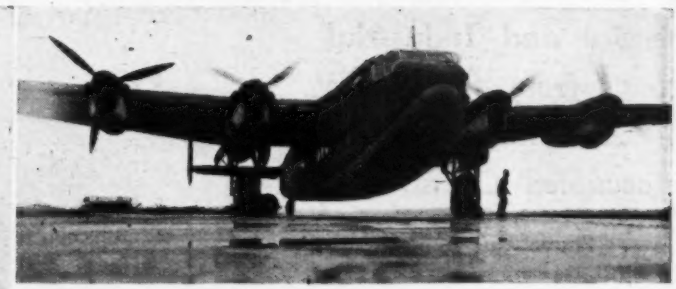
LT. GENERAL SIHVO, Chief of Finland's civil defence, referred in an interview to the intensification of the air war, saying that there is no longer any attempt to distinguish between military and civil targets, the aim being to destroy the enemy's material and spiritual values.

It is, therefore, possible, said the general, that when feelings are sufficiently embittered, poison gas may be resorted to in air raids. Shelters must therefore be made gasproof; gas masks alone are insufficient.

Inspection

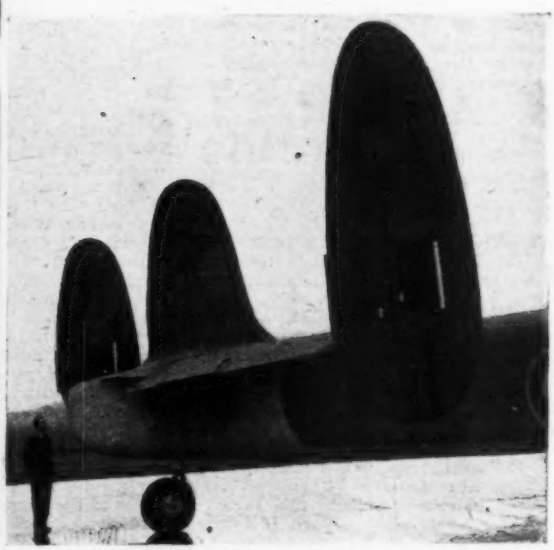
LUFTWAFFE units stationed in Southern and Western Germany and in some parts of the occupied western territories were inspected by Goering during his recent three weeks' tour of these regions. The main object of his visit was apparently to inspect the efficiency of the air defences, in particular of the night and day fighter formations and A.A. units.

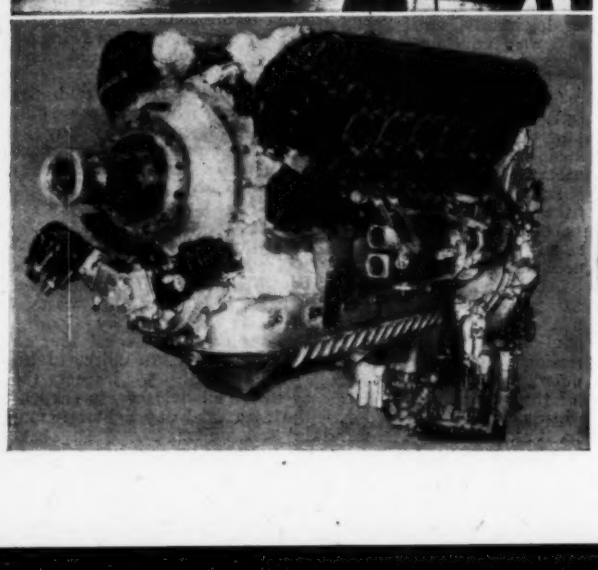
The Avro York . . .



The three-quarter front view above emphasises the roomy proportions of the Avro York fuselage. The figure by the port wheel gives an indication of size. The landing-loads on each of the tyres must be enormous. On the left is an underside view showing how the Merlins are fitted with their line of thrust some inches below the wing.

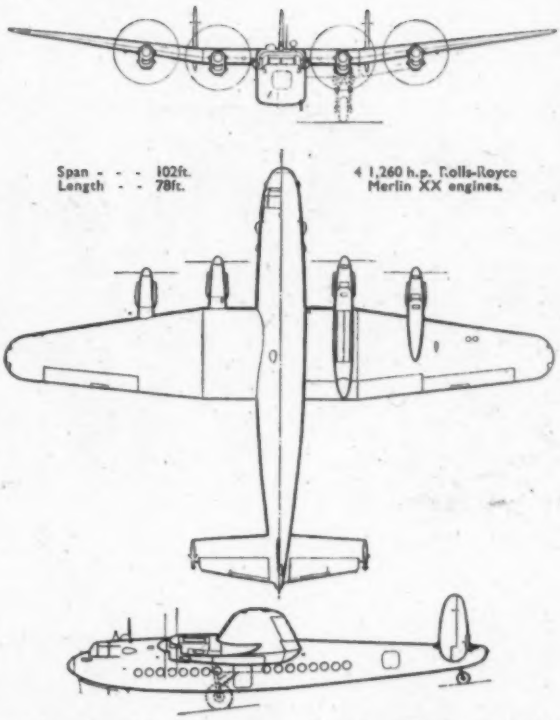
(Above) A three-quarter rear view showing the pointed stern. The split flaps, which are in four sections, at about the midway position of their travel. (Left) Attending to one of the Rolls-Royce Merlin XX power eggs.





(Above) The triple tail and the double-tread Marstrand tail wheel. The central fin has no movable part. (Left) The 1,260 h.p. Merlin XX engine of the type fitted to the York.

...mments on Our Newest Air Liner/Freighter: Mixed Loads and Variable Ranges



AS long ago as December last the Avro York was mentioned in a Commons debate by Mr. W. R. D. Perkins. He said it had been designed as a bomber and converted for use with the Army.

It is, in fact, a transport version of the Lancaster bomber. The wing and engine installation remain the same. An almost square fuselage with accommodation for over fifty passengers takes the place of the Lancaster's fuselage with its bomb bays, flare chutes and gun turrets.

The cabin fuselage is sufficiently different to destroy nearly all the likeness to the Lancaster, and the central fin on the tail completes the dissimilarity. Apparently the change of fuselage shape has altered the airflow over the tail, but it will be interesting to see whether a twin tail of different design will be fitted or whether the present triple tail will remain.

One of the secrets of the Lancaster's success is the uninterrupted airflow over the top surface of the wing. This has been achieved by employing the high-wing arrangement and also by underslinging the Rolls-Royce Merlin power eggs below the wing. This layout has been retained in the Avro York with equally good results. Although the tendency nowadays is towards higher and even higher flying, passengers still want to see where they are going, and the high-wing arrangement allows an excellent, unobstructed view for all the passengers.

The internal equipment has been so designed that the aircraft is easily and quickly convertible for use as an all-passenger or all-freight aircraft. It is, of course, equally adaptable for mixed passenger/freight cargo. Special large hatches are fitted to enable bulky consignment to be stowed. The York has sufficient fuel capacity for long-range flying, but, obviously, the ratio of freight to fuel can be altered to suit range and load. When employed on short ranges it is capable of carrying over 50 passengers.

The four Rolls-Royce engines are Merlin XXs driving de Havilland three-bladed, hydromatic, fully feathering airscrews. Muffs cover the exhaust stubs to prevent exhaust flames showing during night flying. An anti-shimmy, double-tread Marstrand tyre is fitted to the tail-wheel.

Blazing the Trail

AIR COMMODORE D. C. T. BENNETT, C.B.E., D.S.O., who is in command of Bomber Command's Pathfinder Force, is an acknowledged expert on navigation, including astro-navigation (he has written text books on the subject) and it was he who first suggested the use of pathfinders to find and mark the target for our night-bombers.

Air Cmdre. D. C. T. Bennett

In *Flight* of June 17th last, there appeared a photograph of Air Commodore Bennett, with other R.A.F. officers, in the company of the Queen during a visit by Their Majesties to an R.A.F. station. In that photograph Air Commodore Bennett was seen wearing beneath his pilot's wings, the small Eagle badge peculiar to Bomber Command's pathfinders, but censorship did not permit any written reference to it at that time. Very fittingly, he was the first man to put up the new Pathfinder badge.

The success of the highly concentrated raids by means of which the R.A.F. is systematically destroying the enemy's war production machine depends in the first instance on that precise navigation which is the essential of the pathfinder. Flying ahead of the bomber formations, the pathfinder aircraft locate the target and then proceed to ring it with coloured light which will be visible to the approaching bombers from a considerable distance as they come in on their given course, and it is hardly necessary to add that, in order to rule out any chance of the enemy scuttling the plan by illuminating an adjacent area of open country, the colour to be used is changed constantly and is a profound secret until the briefing takes place immediately before each attack.

Ordinary good navigation is quite sufficient to bring the bombers well within sight of the ringed target marked out by the "wizard" navigators in the pathfinder aircraft, and so there is an assurance that every bomber will reach the target at its appointed time and make its run to the second; to drop some 2,000 tons of bombs on a target within the half-hour obviously does call for very exact timing.

Air Comdre. Bennett, who is aged 33, was born at Toowoomba, Queensland, Australia, but his present home is in Yorkshire. He first came to this country as a cadet pilot of the R.A.A.F. in 1931, took a flying-boat course at Calshot the following year and, when placed on the Air Force Reserve in 1935, joined Imperial Airways. Navigation has always been his especial study, and in 1938 he set up a new long-distance record for seaplanes by flying the Mercury, the top half of the Mayo composite experiment, from Scotland to South Africa. He followed this up the same year by flying the Mercury across the Atlantic.

The present Atlantic ferry service was itself inaugurated by Bennett who, as was mentioned in *Flight*, November 4th, led the first flight of seven Hudson bombers from Newfoundland to Great Britain in November, 1940.

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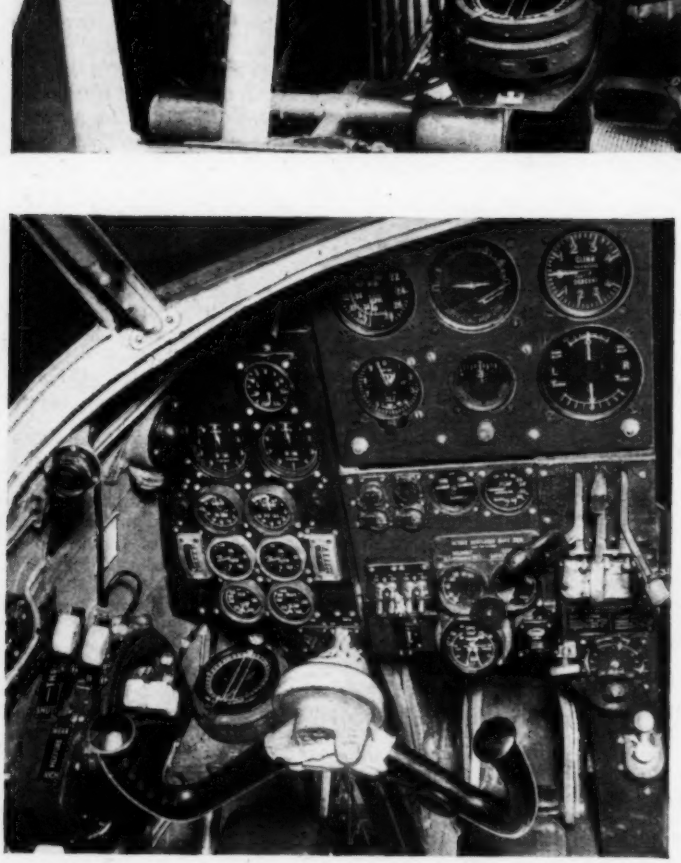

The excellent layout of instruments and controls on the Mosquito maintains the very high standard of this magnificent aircraft.

Pointers of Accurate Flying: Friends Which Never Flatter and Seldom Fail

THIS article deals with the instruments included in the standardised blind-flying panel. It gives a picture of the use to which the instruments are put and explains briefly their construction and the principles upon which they function. A second article on engine and ancillary services instruments will be included in a later issue.

THE imposing array of dials, levers, switches, knobs and taps that meet the gaze of the layman when first he sees a modern aircraft's cockpit is rather frightening. It seems inconceivable that anyone could possibly pay attention to all the instruments all the time, and the bewildered spectator goes dazedly away with a profoundly increased respect for the superman qualities of the pilot. This is a grand opportunity for the latter to indulge in a spot of line-shooting, but to give him due credit, the average pilot has a well-developed respect for the work done by instruments and is sensitive to the fact that some wretched day when "sparrows are walking" those same instruments will be his only hope of safely reaching the beautiful, firm earth again, complete with aircraft.

Despite the nightmare appearance of the

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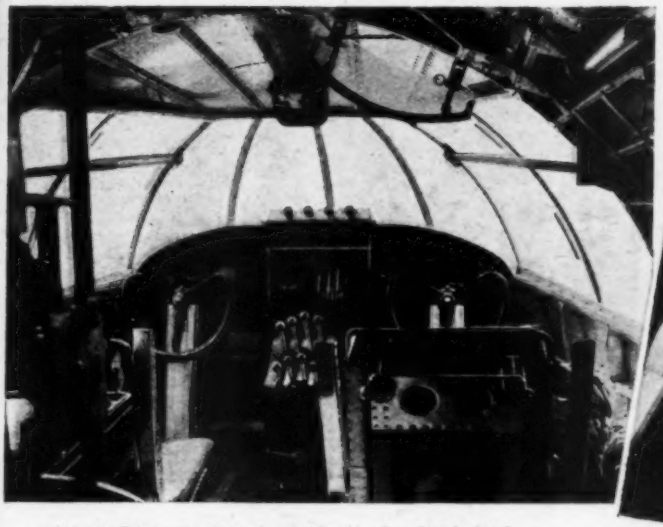
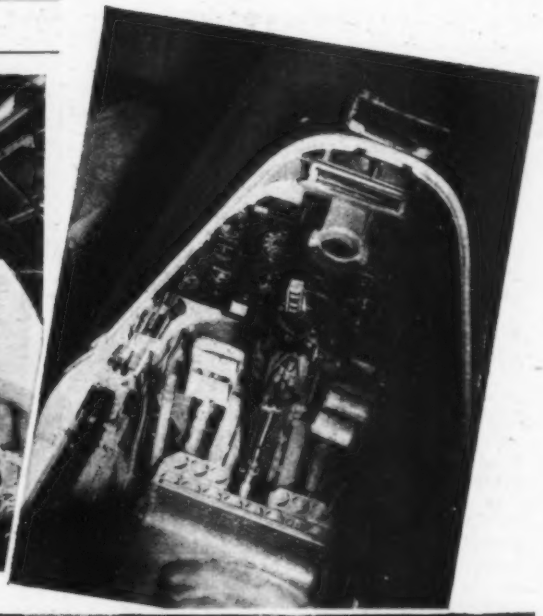
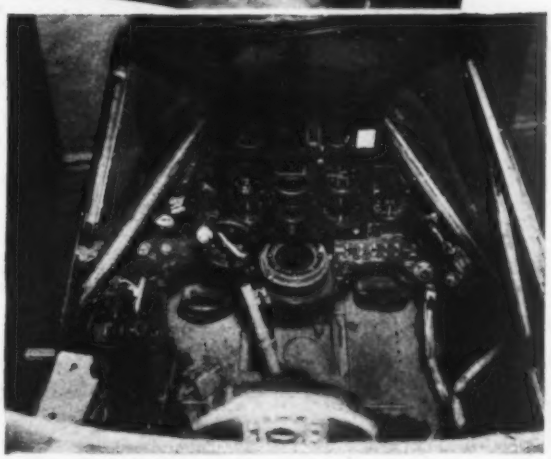




(Above) The well lighted "bridge" of a Sunderland.
(Top, right) The trim layout of a Seafire's "clocks."

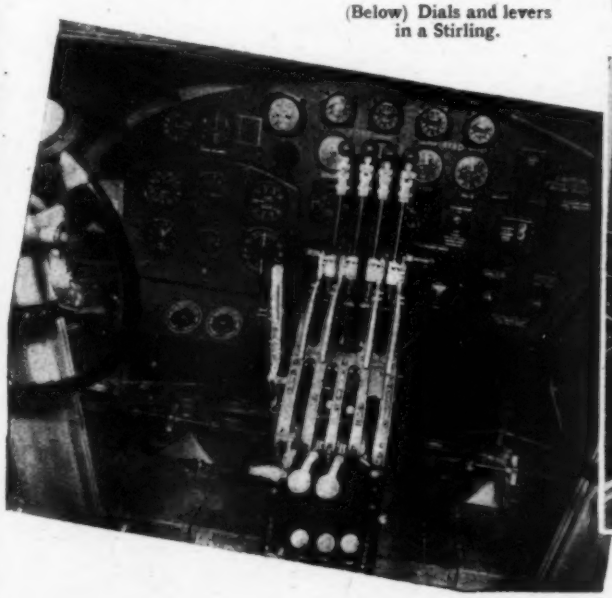
cockpit, all British aircraft (except the most elementary civil types) are fitted with a set of six flying instruments, standardised by the Air Ministry as to design and layout, arranged in what is termed the "blind-flying panel." A Tiger Moth has an identical blind-flying panel to that fitted in a Lancaster or Beaufighter, and it is with the six instruments grouped on this panel that the pilot is primarily concerned for controlling the flight attitude of the machine.

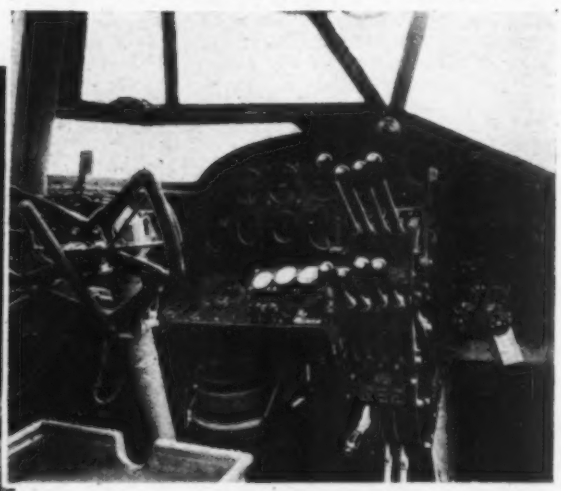
Engine instruments are equally vital, and two in particular, the engine revolutions indicator and the boost pressure gauge, are used in conjunction with the flying instruments. These two are primarily concerned in the correct adjustment of power output for any given flying condition, and whilst there are additional engine instruments which indicate specific conditions of engine operation, they are used only indirectly by the pilot and do not



Fairey feature. The panel of an Albacore.

(Below) Dials and levers in a Stirling.





The Handley Page Halifax "office"—gauges and controls.

AIRCRAFT INSTRUMENTS

concern him objectively with controlling flight attitude.

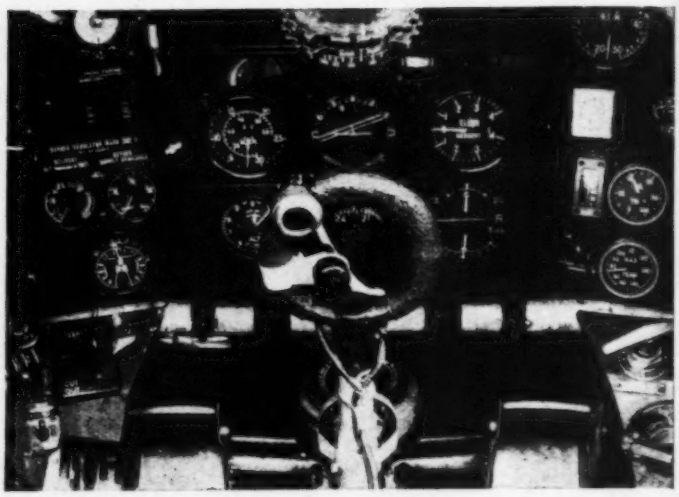
The instruments on the blind-flying panel are the air speed indicator, sensitive altimeter, artificial horizon, directional gyro, rate-of-climb indicator and turn-and-bank indicator. The whole panel is flexibly mounted, and the individual instruments are so designed that the natural vibration frequency of parts of their mechanism bears no resemblance to any resonance frequency of the engines. This is essential in avoiding needle vibration, which would otherwise negative the value of the instruments' accuracy.

The panel is always mounted directly facing the pilot, with the artificial horizon and the directional gyro on the vertical centre line of his vision so that maximum concentration with a minimum of effort can be afforded when flying completely "blind."

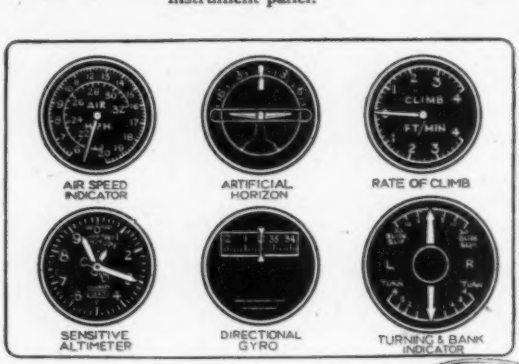
What must be remembered is that, although each instrument gives an accurate indication of a specific performance, these indications are not evaluated separately by the pilot; there is a close connection between the various readings of all the flight instruments, and it is the interpretation of this connection which allows the pilot to fly safely nowadays in conditions which a few years ago would have called for an armchair, a jug of ale and a large, cheerful fire.

The compass is both a navigational and a flight instrument and is usually fitted in the most convenient position in the cockpit. There is no sort of standardisation as to where the compass shall be fitted, and one finds them either on the right or left, on a shelf under the flight panel, or somewhere between one's knees and ankles.

Lack of space prevents dealing with a representative selection of major instruments in one issue, so only the flight instruments are dealt with this week, whilst engine instruments and ancillary service instruments will be described in a later issue.



Neatness and simplicity characterise the arrangement of the Typhoon's instrument panel.



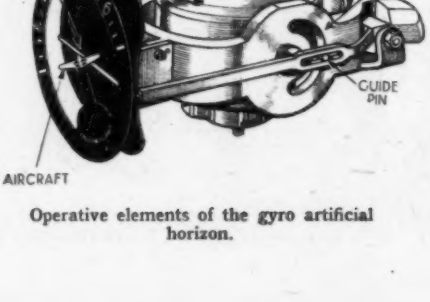
The standard blind-flying instrument panel and the magnetic compass.

Artificial Horizon

The Artificial Horizon is an instrument which provides the pilot with an accurate definition of the flight attitude of his aircraft relative to the horizon. Developed by the Sperry company, the instrument shows on a dial the rear view of a miniature aircraft against a horizon bar. The upper half of the dial rim is calibrated in units of 10 deg. left and right of a central zero, and a pointer head having coincident movement with the horizon bar indicates against this scale level flight or the angle of bank. The horizon bar is capable of vertical as well as rotary lateral movement, and can thus register climb, glide or dive by appearing above or below the miniature aircraft silhouette. The instrument does not indicate the extent of vertical aircraft movement (this is shown conjointly by the climb indicator and the altimeter), and is not intended to be used in this connection beyond a general indication of the horizon position.

The miniature aircraft is securely attached to the instrument case, the horizon bar and angle-of-bank pointer being on a movable background plate. Thus the instrument aircraft image is always presented to the pilot in the same relation to the actual aircraft, and the artificial horizon moves behind the image so that the bar is always parallel to the true horizon (except in extreme manœuvres, such as rolls, loops, etc.).

Movement of the horizon bar is governed by a free gyroscope mounted in gimbals with its rotational axis vertical. The wheel is driven at about 10,000 r.p.m. by jets of air impinging on notches cut into the wheel periphery, the flow of air through the jets being obtained by enclosing the wheel in an airtight case which is connected to a venturi tube. Reduction in pressure of air passing through the venturi sets up a suction in the instrument case, a vacuum tends to form, air rushes through the jets into the case and in so doing impinges on the wheel, the air then being exhausted through four ports.



Operative elements of the gyro artificial horizon.

The gyroscope tends always to define the vertical *in space, not in relation to the earth*. Thus, a gyroscope at the equator, with its rotational axis truly vertical, will at the end of six hours have its axis horizontal, due to the rotation of the earth through 90 deg. during that time. This property cannot be disregarded, and to keep the wheel axis defining the vertical there are four pendulous vanes hanging from the gyro housing, each covering half the area of each of the four exhaust ports when in a true vertical position, but if the wheel axis moves from the vertical, one port is uncovered to a greater extent than the other three, and the reaction of airflow through this port moves the wheel axis back to its normal position.

In a turn, the vanes are subjected

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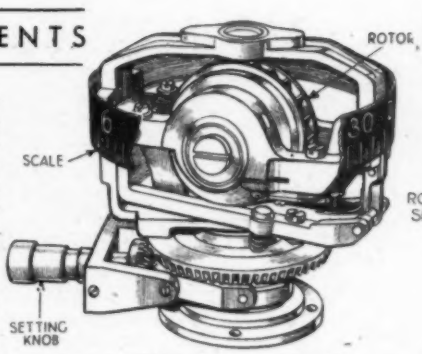
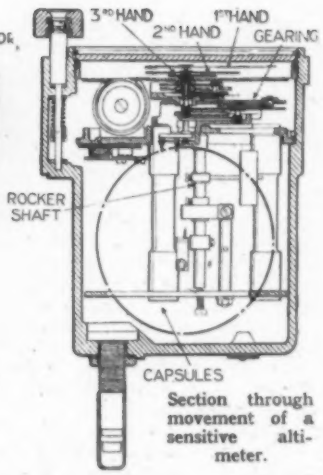
to acceleration forces as well as to gravity and so do not hang vertically. This causes the above action to take place whilst the wheel axis is vertical and consequently displaces the axis slightly. The effect is worst in a turn of 180 deg., but even then is only about 3 deg. to 5 deg., whilst about a minute after straight flight is resumed, the instrument will again give accurate indications. The error is not cumulative in continuous turning, and in a complete turn of 360 deg. it neutralises itself.



Partial section through the directional gyro.



Section through movement of a sensitive altimeter.

Directional Gyro

The Directional Gyro informs the pilot whether he is flying in a fixed direction, by indicating on a ribbon card against a lubber line the angle of any deviation he may make from his original heading. The instrument does not show how fast the aircraft is turning (irrespective of the rate of turn) but indicates only the angle through which it has been turned. This property enables the pilot to hold a fixed course even when "blind," which cannot be achieved with a magnetic compass unless the aircraft is flying at a fixed speed on an even keel. The errors in the magnetic compass are dealt with in the description of that instrument; however, the directional gyro must be set from the compass as it has not the property of defining north, it only defines a constant direction and must be re-set from the compass approximately every fifteen minutes. The wander during this period is between 3 and 5 degrees and is due to the effect of precession in the gyro element, brought about by rotation of the earth and friction in the gimbal bearings.

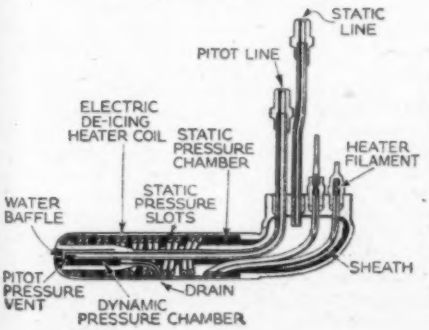
Precession is that phenomenon which causes the axis of any rotating mass to trace out a cone if disturbed, and in a gyro wheel mounted in gimbals the effect is to induce the wheel to take up a position at right angles in the same axial plane as its original position, when the disturbing force is applied to the rotational axis in a plane at right angles to the plane of rotation. In other words, when a gyro wheel is rotating about a horizontal axis and an attempt is made to pull down vertically one end of the spindle, instead of the wheel tilting towards the pull, it will swing round sideways.

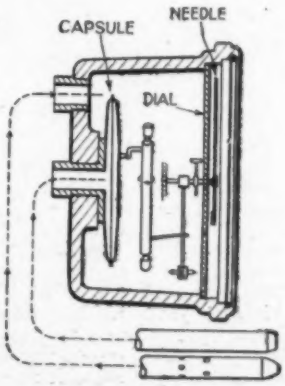
It is this property of precession common to all gyroscopes that makes them so suitable for actuating various instruments.

Air Speed Indicator

The Air Speed Indicator is a sensitive differential pressure gauge measuring the difference between the static pressure of the atmosphere surrounding the aircraft, and the impact pressure of the air due to the motion of the aircraft. These pressures are obtained from a pitot head consisting basically of two forward-facing tubes, one (the pressure tube) with an open forward end which receives the full impact pressure of the air, and the other (the static tube) with a closed forward end but with a series of small holes or slots in the tube wall so that the pressure within the tube is always that of the surrounding atmosphere.

(Right) **Diagrammatic section showing operation of the air speed indicator.**
(Below) **Section through streamlined, electrically heated pitot head.**





Pipe lines from the pressure and static tubes are led to the instrument case which is made airtight and contains a sealed capsule. The capsule is a flat, circular, hollow container, and the pressure tube is connected to its interior. The static tube is connected into the instrument case and the difference between the pressures inside and outside the capsule causes it to expand, the expansion being used to actuate the indicating needle through a gear train, so that a large needle movement is obtained for a small capsule movement.

Modern aircraft are usually fitted with a streamlined pitot head incorporating both tubes in one outer sheath, the whole unit being electrically heated to prevent ice formation.

The A.S.I. does not indicate true airspeed since the increase in pressure due to the aircraft's speed V is $\frac{1}{2}\rho V$ where ρ is the density of the air. Consequently with increasing altitude (as the density gets less) the indicated airspeed is lower than the true airspeed. A simple rule-of-thumb for calculating the T.A.S. from the I.A.S., if extreme accuracy is not required, is simply to add 2 per cent. of the I.A.S. for each 1,000ft. of altitude. For example, if the I.A.S. is 120 and the height is 8,000ft., the T.A.S. will be roughly 139 m.p.h.

Altimeter

The Altimeter is constructed on the same principle as the ordinary aneroid barometer. It is a pressure-indicating instrument, its action depending on the fact that air pressure diminishes with altitude. As it is also affected by variation of air pressure at ground level due to atmospheric conditions, it is provided with an arrangement whereby the pilot can set the needle to zero before starting his flight.

Altimeters are adjusted by the makers to indicate correctly in what is called the "standard atmosphere," which represents a mean average of the variations known to exist at given heights. Thus, an indicated height of 15,000ft. actually means that the aircraft is flying at an altitude which has an atmospheric condition characteristic of a height of 15,000ft. in the standard atmosphere. This might differ materially from the actual height at which the aircraft is flying.

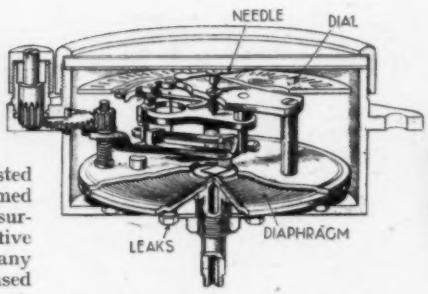
Altimeters are actuated by capsules similar to those used in air speed indi-

AIRCRAFT INSTRUMENTS

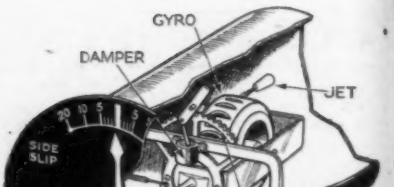
cators, but altimeter capsules are hermetically sealed after the air in the interior is exhausted and thus become varyingly deformed according to the pressure of the surrounding atmosphere. The sensitive type of altimeter may have as many as three capsules to provide increased deformation for the purpose of operating three separate needles through three sets of gearing.

There is only one scale on the dial, marked from 0 to 10, each main division being sub-divided into 5. The long needle registers hundreds of feet, the intermediate needle thousands of feet, and the short needle ten thousands of feet. By using this arrangement a dial of three scales with its complication of markings and numbers is avoided.

A small window in the dial shows a barometric scale in millibars, and if the barometric reading on the ground at the airfield being approached can be obtained by radio communication this scale is set to it, and the sensitive altimeter then registers actual height above this airfield. Although this is not the height above the country being flown over, it is of much greater value to the pilot than knowledge of his height above sea level.



Perspective section showing the mechanism of a rate-of-climb indicator.



Diagrammatic illustration of the interior of a turn-and-bank indicator.

Rate-of-climb Indicator

The Rate-of-Climb Indicator (which also indicates rate of descent) is a sensitive differential pressure gauge acting in accordance with the variation of atmospheric pressure with altitude. The case of the instrument houses a capsule, the interior of which is connected to the static tube of the pitot head. The capsule has a series of minute leaks in it, and as the aircraft climbs and the atmospheric pressure decreases, an inflow of air through the leaks from case to capsule occurs, corresponding with the difference in air pressure. The leak acts as a brake on the equalisation of pressure, the difference being employed to measure the rate of climb (and descent) by means of a manograph mechanism.

This is simply the capsule, whose deformation with varying pressures actuates the indicating needle via a rocker shaft, toothed sector and the needle-shaft pinion.

This instrument must withstand excessive overload pressures despite its nominal sensitivity, as nowadays dives at the rate of 40,000 feet/min. are not exactly rare. To meet this contingency, overload stops are fitted to prevent damage to the mechanism. A zero adjustment is also fitted to allow resetting the needle to zero if a "zero shift" occurs. This is common to all rate-of-climb indicators and is brought about by conditions of heavy overloading and fluctuations of the capsule diaphragm.

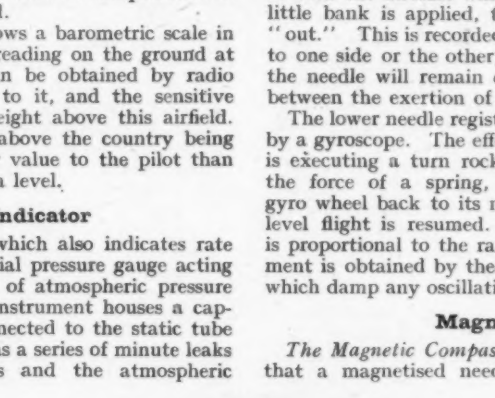
Turn-and-bank Indicator

The Turn-and-Bank Indicator operates on two separate principles for each of its two functions. The upper needle, which registers sideslip "in" or "out," is a simple pendulum and indicates whether the aircraft is taking a true path in a state of equilibrium about a given axis during a turn. Should too much bank be applied for a given rate of turn the aircraft will sideslip "in"; conversely, if too little bank is applied, the machine will skid, or sideslip "out." This is recorded by movement of the upper needle to one side or the other, whilst in a correctly banked turn the needle will remain central, being held in equilibrium between the exertion of centrifugal force and gravity.

The lower needle registers the rate of turn and is actuated by a gyroscope. The effect of precession when the aircraft is executing a turn rocks the gyroscope sideways against the force of a spring, which also serves to bring the gyro wheel back to its normal position when straight and level flight is resumed. The degree of precession effect is proportional to the rate of the turn, and smooth movement is obtained by the incorporation of two air dashpots which damp any oscillations set up in the gyro mechanism.

Magnetic Compass

The Magnetic Compass functions on the basic principle that a magnetised needle freely pivoted approximately about its centre, so that it remains level, will point to magnetic north. There is also a vertical component of the attractive force acting on such a needle, so that if it were balanced exactly on its centre of gravity after magnetising, it would dip downwards as well as point to north; for this reason the needle is not balanced on its c.g. and will consequently give reliable indications when the aircraft is in straight and level flight. Unfortunately, when a turn is being executed this reliability is apt to suffer, e.g., when an aircraft is flying northward and a correctly banked turn is made to east or west, the compass is no longer horizontal but is parallel to the floor of the cockpit and at an angle to the earth's surface. In this position the vertical component of the earth's magnetic field acting on the north-seeking end of the needle causes that end to be deflected downward.



The magnetic compass.

The steeper the turn, the worse the effect, maximum error being obtained in a vertical bank when the needle would point almost straight down. This action is called northerly turning error and is the most serious error with which the user of a compass has to contend, rendering the instrument virtually useless for judging the extent of any but the slowest and flattest of turns. It is for this reason that the directional gyro is used in controlling the angle of turns, the compass being used again for final set-

AIRCRAFT INSTRUMENTS

tling on the new course after normal flight has been resumed.

The compass consists of an outer casing in which is fitted the compass bowl, filled with a de-aerated liquid, usually alcohol, which damps the oscillations of the magnetic system. The needle is integral with two parallel magnets supported on a jewelled pivot bearing above the c.g. so that the weight will keep the needle assembly almost horizontal; it cannot keep it truly horizontal because of the dip of the magnets. Attached to the magnets are glass damping filaments which are pulled through the liquid when the needle moves and by so doing enable the needle to settle quickly without oscillation. The north-seeking end of the needle is indicated by a luminous arrow-head to distinguish it from the south end.

The grid ring, which can be rotated and locked, is fitted above the bowl and is calibrated in divisions of 2 deg., numbered in 10 deg., and has the quadrantal and cardinal points lettered, the north N being enclosed in a bold triangle. The grid consists of two parallel wires running between north and south on the ring, and marked on the bowl is a short, luminous line called the lubber line; this is always on, or parallel to, the fore-and-aft centre line of the aircraft.

In use, the pilot rotates the grid ring until the course on which he is going to fly is brought opposite to the lubber line; he then clamps the grid ring and turns the aircraft until the compass needle lies parallel between the grid wires, with the N-end of the needle opposite the N on the grid ring; the aircraft is then on the desired course.

First Anti-U-boat V.C.

The King has been graciously pleased to confer the Victoria Cross in recognition of most conspicuous bravery on F/O. L. A. TRIGG, D.F.C., No. 200 Squadron, Royal New Zealand Air Force.*

F/O. Trigg had rendered outstanding service on convoy escort and anti-submarine duties, and had completed 46 operational sorties, invariably displaying skill and courage of a very high order.

One day in August, 1943, F/O. Trigg undertook, as captain and pilot, a patrol in a Liberator, although he had not previously made any operational sorties in that type of aircraft. After searching for eight hours a surfaced U-boat was sighted.

F/O. Trigg immediately prepared to attack. During the approach the aircraft received many hits from the submarine's anti-aircraft guns and burst into flames, which quickly enveloped the tail. The moment was critical. F/O. Trigg could have broken off the engagement and made a forced landing in the sea. But if he continued the attack, the aircraft would present a "no-deflection" target to deadly accurate anti-aircraft fire, and every second spent in the air would increase the extent and intensity of the flames and diminish his chances of survival.

There could have been no hesitation or doubt in his mind. He maintained his course in spite of the already precarious condition of his aircraft and executed a masterly attack. Skimming over the U-boat at less than 50ft., with anti-aircraft fire entering his opened bomb doors, F/O. Trigg dropped his bombs on and around the U-boat where they exploded with devastating effect. A short distance farther on the Liberator dived into the sea with her gallant captain and crew. The U-boat sank within 20 minutes, and some of her crew were picked up later in a rubber dinghy that had broken loose from the Liberator.

The Battle of the Atlantic has yielded many fine stories of air attacks on underwater craft, but F/O. Trigg's exploit stands out as an epic of grim determination and high courage. His was the path of duty that leads to glory.

*F/O Trigg is now posted as missing, believed killed.

THE AIR LEAGUE AND THE EMPIRE

NEARLY everyone of note in British aviation, it seemed, was present at the luncheon which the Air League of the British Empire gave last week to London representatives of the Empire Press. The Duke of Sutherland, president of the Air League, welcomed the guests. He recalled that in the past the Air League and the Press found relatively little common ground. That was because the Press wanted news and the Air League wanted progress; there was little progress and the news was mostly sensational.

During the many years since its foundation in 1909, the Air League had tried to help along the best projects, and had generally been right. It was tragically right during the 'thirties when crying for the expansion of the R.A.F. In 1934, at the instigation of the Air League's then Secretary-General, Air Comdre. Chamier, it started something more popular than it had itself expected: the first Empire Air Day. In 1935 the Air League began to train young pilots at half-price. The biggest thing occurred in 1938, when the Air Cadet movement was begun. In one year its strength grew to 20,000. The Air Cadet Corps was taken over by the Air Ministry in 1941 and transformed into the present Air Training Corps.

The Air League, His Grace continued, seemed to have been fated to do the spade work for Governments. It was content to be layers of foundations and architects of future edifices, and it was becoming clear that each decade placed new duties of this sort on the League. Commercial air transport should gain in the long run from the interruption of war. The Air League was hoping to detect the energy and industry in Governments of the Empire which would have to be expended in the cause of air transport, and urged the Government at Westminster to do its duty in preparing routes, amplifying research, encouraging aircraft development, and admitting to aircraft operation such operators as can satisfy the highest standards.

The Air League wanted to know what were the needs, the reactions, the aspirations and the determinations of the Dominions in relation to the greatest of all cohesives—air transport. When more was known about the trend of opinion His Grace hoped there might be good cause for the establishment of air leagues in the Dominions, and the Air League in London would do its best to maintain contact with them so that the cause of Empire flying might be pressed with some degree of uniformity.

The Duke of Sutherland concluded by outlining some of the things which the Air League of the British Empire wants: The revival of the flying clubs; the provision of efficient airports with meteorological and radio-location facilities; the allocation of air mail contracts to British and Dominion air lines at remunerative rates; the admission of established shipping companies to the operation of air lines. The Air League would welcome on its executive committee energetic representatives of the Dominions.

CORRESPONDENCE

The Editor does not hold himself responsible for the views expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

A MERLIN MYSTERY

Peculiarity During Mag. Tests

AS yet I have been completely unable to find an explanation for the following:—

While warming-up a Merlin XX engine on the ground, the magnetos were listed at +6lb. boost. There was a drop of approximately 50 r.p.m. on each magneto, but each time the starboard mag. was switched off an appreciable "kick" backwards was felt on the throttle lever. This also occurred when the mag. was switched on again.

Perhaps you or a reader can offer some explanation.

I was quite sober at the time! The incident was witnessed by my flight engineer and two ground-crew sergeants.

R. E. GOODCHILD, P/O.

PACIFIC PERFORMANCES

Comparison of Buffalo and Martlet

RECENTLY we have read a book about the fall of Malaya in which it is said that the Brewster Buffalo was a complete failure. This opinion is supported by other journals, including your own.

At the same time the Martlet and its variants have been greatly praised for their engagements with much superior enemy machines than the Buffalo had to face.

In short, the Martlet is a much superior plane in practice, yet on paper there seems to be very little difference between the two types, as their speeds, armament, climb, ceiling, etc., are very similar, with the Buffalo having the advantage of a much longer range.

Could any of your readers please answer this query?

"PUZZLED PAIR."

AIRPORT DESIGN

Points Against Tangent Runways

I HAVE read with interest the short article in your issue of October 21st on the suggestion of tangent runways for Idlewild. At first sight this scheme appears greatly to increase possible movements whilst minimising taxi-ways and perimeter tracks for a site that must have clear approaches in all directions. On further consideration, however, there seem to be certain difficulties.

The first and most obvious of these is that the area of the centre "core" in which must be placed all fuelling and servicing areas, hangarage, terminal buildings and car parks, is defined from the start and can never be varied to suit changing requirements; the second is that all road (and rail) traffic can only reach this central core through tunnels of considerable length.

The others concern air approach. Presumably any particular aircraft may, during bad weather, be guided by radio on to any one of sixteen landing strips of which a constantly varying five are in simultaneous use. Does this imply that each aircraft must tune in to a different wave-length before starting his approach; and may it not involve aircraft of differing speeds crossing each other's tracks before each has found his appropriate approach line? Also, in past practice, every effort has been made to give an aircraft that has overshot its approach a clear path in which to continue its flight, whereas under this scheme an aircraft that has touched down but has failed to stop within the prescribed distance might cross the paths of at least three other machines that were landing simultaneously.

There are in addition considerations of route saturation as opposed to airport saturation, and the relative cost of one necessarily elaborate and intricate organism against two or three more orthodox airports each serving a different sector of the country. Would London be better served by rail if everyone went to one enormous station with a maze of different points and levels rather than, as one now goes, to Euston or Kings Cross for the north, Paddington or Waterloo for the west, and Victoria or Charing Cross for the south? Might there not be road congestion as well as rail congestion, and would it really be cheaper? And what a chance for enemy action!

I am writing without any feeling of destructive criticism and hope indeed that others may be induced to point the solution to the difficulties that I have indicated; but I think that in this country we are realising that the basic principles of flexibility and dispersal apply in peace as well as war, and I feel that this ingenious and imaginative suggestion for Idlewild essentially opposes both these principles.

GRAHAM DAWBARN,
M.A., F.R.I.B.A., M.I.Struct.E., A.F.R.Ae.S.

BOMBER ARMAMENT

Comparative Muzzle Horse-power

I HAVE read with interest the letter by C. E. Cowen on "Bomber Armament," and I would like to reply to some points raised.

It seems to me that there is no doubt that the 0.5in. machine-gun is much more efficient than the 0.303in. for bomber armament of all types. What is the advantage of a vast 0.303in. two-gun turret on the top of the Halifax II over the 0.5in. small dorsal two-gun of the Fortress II? So great is the superiority of the 0.5in. gun that even two of them have a greater m.h.p. than four 0.303in. guns. And yet the Air Ministry, although changing over from the 0.303in. to the 20 mm. cannon in fighters, has not increased the bomber armament in calibre at all.

The Americans may find themselves in a similar position. The 0.5in. gun will soon become too small in fighters or bombers, and the same conservatism which desires to keep on with the 0.303in., because it was successful in 1940, will desire to keep on with the 0.5in. as it was so successful in 1943! To keep up with the enemy, constant changes are necessary in air warfare.

Thus, while realising fully that both the U.S.A.A.F. and the R.A.F. are doing excellently, they should both co-operate more than at present. The Americans do not do things by halves—when it is clear that the Merlin engine and nose bombs are advantageous and necessary, it adopts them at once. Let us take over an American advantage—the 0.5in. gun.

"YOUNG SPOTTER."

THEORY OF FLIGHT

Gliding Duration and Distance

IT is with the greatest of temerity that I, a novice with but a few trifling hours' solo in a pre-war log-book, poke my ignorant nose into this learned discourse, and I only do so in a desire to learn.

In spite of what has been said I have to admit that, were I to find myself suddenly deprived of engine power and saw that the only reasonable spot for a forced landing lay a doubtful distance up-wind, my every instinct would be to hurl every loose piece of equipment overboard in an effort to "lighten ship" as much as possible.

As "Pilot, R.A.F." observed last week, there is only one angle of attack which gives the optimum gliding angle, but does not that angle vary according to the wing-loading? If so, then it would seem that the lighter the load the smaller that angle of attack need be and, therefore, the flatter the optimum gliding angle. Since all this has nothing to do with the movement of the atmosphere over the earth's surface, then one would expect (being an ignorant novice) that it would not matter which way the wind was blowing.

On the other hand, it is easy to see that forward speed in relation to the wind has a definite bearing upon distance covered. As an extreme example, a forward air-speed only equal to that of the opposing wind would result in a lift-like descent immediately beneath the point of engine failure, whatever the gliding angle.

"BEMUSED."

Gas Turbines and Jet Propulsion for Aircraft

By G. GEOFFREY SMITH, M.B.E.

A second edition of the above booklet is now available from "Flight" publishing offices. The new work consists of ten chapters and includes many illustrations. Price 3/6 plus 3d. post.

Sqn. Ldr. R. Davies conducts a service for men of a Warhawk squadron at a dispersal point on an Italian airfield. A piano accordion provides the music.

SERVICE AVIATION

Royal Air Force and Fleet Air Arm News and Announcements

Awards

Far East

THE KING has been graciously pleased to approve the following awards in recognition of gallantry displayed in flying operations against the enemy in the Solomon Islands:—

Distinguished Flying Cross

Flt. Lt. E. H. BROWN, R.N.Z.A.F.
F/O. G. B. FISKEN, R.N.Z.A.F.

Distinguished Flying Medal

Sgt. R. C. C. NAIRN, R.N.Z.A.F.

THE KING has been graciously pleased to approve the following awards in recognition of gallantry displayed in flying operations against the enemy:—

Distinguished Service Order

Act. Wing Cdr. G. H. D. EVANS, D.F.C., R.A.F.—Wing Cdr. Evans has completed three tours of operational duty. He has made a number of bombing attacks on enemy territory, and has completed many patrols and bombing or torpedo strikes against enemy shipping. This officer has also participated in many photographic reconnaissance flights while in France and subsequently from this country. During four of his operational missions, his aircraft has been damaged by anti-aircraft fire. On one occasion he was leading his squadron to attack a very heavily escorted enemy vessel in the Bay of Biscay. Although Wing Cdr. Evans' aircraft was severely damaged and set on fire, he continued to lead the squadron and completed a telling attack with great gallantry.

Act. Wing Cdr. L. L. JOHNSTON, R.A.F.O., No. 458 Sqn.—Wing Cdr. Johnston commanded this squadron from March, 1943, to June, 1943, and previously acted as flight commander. During a difficult period he did excellent work in reforming the squadron, and himself bore the major part of the onerous task of training the crews. This officer has completed a number of sorties with the squadron, mainly on shipping strikes, and has destroyed two enemy vessels.

Act. Wing Cdr. C. J. MOUNT, D.F.C., R.A.F., No. 104 Sqn.—An outstanding leader of a bomber squadron, Wing Cdr. Mount has completed three tours of operational duty, and has commanded his squadron since March, 1943. He has taken part in many sorties, and in May, 1943, participated in an attack on Messina. Despite intense and accurate opposition, he pressed home his attack, and although his aircraft suffered damage from the enemy defences, very good results were obtained.

F/O. A. J. DAVEY, R.A.F.V.R., No. 502 Sqn.—This officer has completed more than five hundred operational flying hours, mainly on convoy escort and anti-submarine patrols in the Atlantic and the Bay of Biscay. During all his missions he has maintained a first-class look-out, and has sighted eleven submarines and attacked eight. He has also been engaged by enemy aircraft twice. On one occasion, although his aircraft had been damaged by gunfire, F/O. Davey continued his patrol and attacked a U-boat. In November, 1942, he attacked a submarine. In March, 1943, he again made an attack on a U-boat, and remained with the convoy he was escorting till he conveyed all necessary information to the ships.

Col. W. T. B. Tasker, Air Liaison Officer for the South African Air Force.

On returning to base adverse weather was encountered, and owing to shortage of fuel F/O. Davey was compelled to abandon his aircraft by parachute.

Group Capt. R. W. BLUCKE, A.F.C., R.A.F.—One night in September, 1943, Group Capt. Blucke was the captain of a Lancaster aircraft detailed to attack a target at Mannheim. During the outward flight the rear turret became unserviceable, and, owing to icing, the elevator trimming gear jammed and rendered the bomber almost uncontrollable. Assisted by another member of the crew, Group Capt. Blucke skilfully maintained control and proceeded to the target, which was bombed and photographed. The aircraft was then flown safely back to base. Group Capt. Blucke has participated in a number of sorties in recent months.

Act. Flt. Lt. J. SALE, R.C.A.F., No. 35 Sqn.—In air operations this officer has displayed great skill and achieved many successes against the enemy's most heavily defended objectives. His unconquerable spirit of determination, great gallantry and fortitude have set an example beyond praise.

Bar to Distinguished Flying Cross

F/O. G. S. BAKER, D.F.C., R.A.F.V.R., No. 107 Sqn.—On August 8th, 1943, F/O. Baker was navigator of an aircraft detailed to attack an important enemy objective. Despite poor weather and the difficult nature of the terrain, he directed his pilot to the target accurately and bombed it with precision. On the return flight further bad weather did not prevent him from guiding the whole formation to a safe landing. Later in August this officer again displayed consummate skill in navigation, when he led his formation against a locomotive works at Denain. The whole formation reached the target without difficulty, and the attack was pressed home vigorously in the face of heavy opposition.

F/O. P. S. KENDALL, D.F.C., R.A.F.V.R., No. 255 Sqn.—This officer has displayed great initiative and daring on intruder patrols. In May, 1943, he attacked an enemy airfield and caused severe damage to several aircraft on the ground. On another occasion he bombed and machine-gunned a hangar at another enemy airfield. He has also made intruder sorties on heavily defended areas in Tunisia. On one of these he entered the circuit of the airfield with enemy aircraft and destroyed one and damaged another. This officer since the award of the Distinguished Flying Cross has continued to display outstanding enthusiasm to engage the enemy, and has destroyed six enemy aircraft and damaged many more.

Act. Sqn. Ldr. S. W. DANIEL, D.F.C., R.A.F., No. 72 Sqn.—This officer has led his squadron on operations resulting in a succession of victories, in which his fine fighting spirit and ex-

SERVICE AVIATION

ceptional ability have been a material factor. He has personally destroyed at least ten enemy aircraft and damaged many others.

Act. Sqn. Ldr. A. K. S. McCURDY, D.F.C., R.A.F.V.R., No. 614 Sqn.—Sqn. Ldr. McCurdy now on his second tour of operational duty, has taken part in a large number of sorties throughout which his splendid example and fine fighting spirit have been outstanding. During night intruder patrols over the Tunisian roads in adverse weather he has bombed enemy convoys from low level, following these engagements up with machine-gun attacks on the scattered vehicles. In March, 1943, this officer made a particularly determined attack on an enemy airfield. In the course of this operation his aircraft, while approaching the target, was badly damaged and the gunner wounded. Nevertheless, Sqn. Ldr. McCurdy completed his mission successfully, and without the aid of his navigator flew safely back to base.

Act. Sqn. Ldr. E. D. MACKIE, D.F.C., R.N.Z.A.F., No. 243 Sqn.—This officer, who commands his squadron, has shown himself to be an exceptional fighter pilot, whose fine fighting spirit, personal courage and determination have been an inspiring example to all. He has destroyed twelve enemy aircraft.

Act. Sqn. Ldr. W. M. SIZER, D.F.C., R.A.F., No. 93 Sqn.—Sqn. Ldr. Sizer has commanded and led his squadron with consistent success throughout the Tunisian campaign. During the present campaign he has been constantly in action, showing great skill and courage on all occasions. This officer has personally destroyed at least nine enemy aircraft and damaged others.

Distinguished Flying Cross

Wing Cdr. A. E. CLOUSTON, A.F.C., R.A.F., No. 224 Sqn.
Act. Sqn. Ldr. E. E. FITCHEW, R.A.F., No. 279 Sqn.
Act. Sqn. Ldr. S. G. WHITING, R.A.F., No. 233 Sqn.
Capt. J. T. SECCOMBE, S.A.A.F., No. 1 (S.A.A.F.) Sqn.
Act. Sqn. Ldr. W. SOUTHALL, D.S.O., R.A.F., No. 179 Sqn.
Act. Flt. Lt. R. T. F. TURNER, R.A.F.V.R., No. 120 Sqn.
F/O. D. C. ALLDERMAN, R.A.F.V.R., No. 70 Sqn.
F/O. F. R. BARKER, R.A.A.F., No. 145 Sqn.
F/O. A. H. GREGORY, R.A.A.F., No. 450 Sqn.
F/O. M. E. JOWSEY, R.C.A.F., No. 92 Sqn.
F/O. D. W. KING, R.A.F.V.R., No. 224 Sqn.
F/O. P. RICHES, R.A.F.V.R., No. 540 Sqn.
F/O. W. WEATHERLEY, R.A.A.F., No. 459 Sqn.
F/O. A. W. WOOD, B.E.M., R.A.F.V.R., No. 502 Sqn.
P/O. W. B. BROWN, R.A.F.V.R., No. 70 Sqn.
P/O. J. DURBURY, R.A.F.V.R., No. 489 Sqn.
P/O. G. HUGHES, R.A.A.F., No. 70 Sqn.
P/O. E. A. KER, R.C.A.F., No. 145 Sqn.
P/O. A. McDONALD, R.C.A.F., No. 404 (R.C.A.F.) Sqn.
P/O. J. H. E. DELANEY, R.A.F.V.R., No. 404 (R.C.A.F.) Sqn.
P/O. B. A. QUINLAN, R.C.A.F., No. 458 (R.C.A.F.) Sqn.
P/O. W. J. WHITE, R.C.A.F., No. 540 Sqn.
Act. Flt. Lt. G. A. J. FRAZER-HOLLINS, R.A.F., No. 101 Sqn.
Act. Flt. Lt. I. ROBERTSON, R.A.F., No. 101 Sqn.
F/O. S. I. KENNEDY, R.A.F., No. 101 Sqn.
Act. Flt. Lt. J. H. WRIGHT, R.N.Z.A.F., No. 35 Sqn.
P/O. S. C. R. MACKIE, R.N.Z.A.F., No. 35 Sqn.
P/O. H. MATTHEWS, R.A.F.V.R., No. 35 Sqn.
F/O. D. G. BENNETT, R.A.F.V.R., No. 55 Sqn.
P/O. R. R. G. APPLEBY, R.A.F.V.R., No. 35 Sqn.
Act. Wing Cdr. E. F. NIND, R.A.F., No. 97 Sqn.
Sqn. Ldr. F. J. AUSTIN, R.A.F.O., No. 623 Sqn.
Sqn. Ldr. L. H. ENO, R.A.F.O., No. 51 Sqn.
Act. Sqn. Ldr. M. CROCKER, R.A.F.V.R., No. 57 Sqn.
Act. Sqn. Ldr. R. E. FAWCETT, R.A.F., No. 156 Sqn.
Act. Sqn. Ldr. M. H. HANKINS, R.A.F., No. 199 Sqn.
Act. Sqn. Ldr. F. J. HARTNELL BEAVIS, R.A.F.V.R., No. 10 Sqn.
Act. Sqn. Ldr. L. G. JOHNSON, R.A.F.V.R., No. 83 Sqn.
Act. Sqn. Ldr. J. JOLL, R.N.Z.A.F., No. 75 (N.Z.) Sqn.
Act. Sqn. Ldr. W. J. LEWIS, R.A.F.V.R., No. 467 (N.Z.) Sqn.
Act. Sqn. Ldr. D. L. PITT, A.F.C., R.A.F.V.R., No. 138 Sqn.
Act. Sqn. Ldr. B. R. QUINLAN, R.N.Z.A.F., No. 158 Sqn.
Act. Sqn. Ldr. H. L. SAUNDERS, R.C.A.F., No. 218 Sqn.
P/O. E. L. PICKLES, R.A.A.F., No. 100 Sqn.
F/O. J. L. DEANS, R.A.F., No. 196 Sqn.

Bar to Distinguished Flying Medal

Flt. Sgt. G. K. SMITH, D.F.M., R.A.F., No. 97 Sqn.—This airman has flown on a large number of operational sorties from France, North Africa and the United Kingdom. His technical ability and his fine fighting spirit make him a valuable member of aircraft crew. He has always displayed coolness when in action. In July 1943 the aircraft in which he was flying was attacked by an enemy night fighter. Flt. Sgt. Smith gave valuable first aid to a wounded comrade in addition to executing his own duties with efficiency.

Distinguished Flying Medal

Flt. Sgt. (now P/O.) H. T. B. ARMSTRONG, R.C.A.F., No. 138 Sqn.
Flt. Sgt. J. W. BETTY, R.C.A.F., No. 103 Sqn.
Flt. Sgt. G. W. BOX, R.A.F.V.R., No. 50 Sqn.
Flt. Sgt. H. CAMPBELL, R.A.F.V.R., No. 161 Sqn.
Flt. Sgt. E. M. CHILDS, R.A.F.V.R., No. 83 Sqn.
Flt. Sgt. (now P/O) L. J. CHRISTENSEN, R.A.A.F., No. 460 (R.A.A.F.) Sqn.
Flt. Sgt. A. G. CLARKE, R.A.F.V.R., No. 61 Sqn.
Flt. Sgt. J. A. COSTELLO, R.A.F.V.R., No. 49 Sqn.
Flt. Sgt. H. B. COXON, R.A.F.V.R., No. 106 Sqn.
Flt. Sgt. A. G. CROMAS, R.A.F.V.R., No. 214 Sqn.
Flt. Sgt. F. V. DE MARCO, R.C.A.F., No. 158 Sqn.
Flt. Sgt. G. W. DICKENSON, R.A.F.V.R., No. 35 Sqn.
Flt. Sgt. F. R. DOLLING, R.A.F.V.R., No. 35 Sqn.
Flt. Sgt. A. DRINKWELL, R.A.F.V.R., No. 83 Sqn.
Flt. Sgt. J. ENDEAN, R.A.F.V.R., No. 83 Sqn.
Flt. Sgt. A. T. FITZPATRICK, R.A.A.F., No. 460 Sqn.
Flt. Sgt. E. J. FOULSHAM, R.A.A.F., No. 106 Sqn.
Flt. Sgt. R. FULLELOVE, R.A.F.V.R., No. 138 Sqn.
Flt. Sgt. J. E. GARDNER, R.A.F.V.R., No. 97 Sqn.
Flt. Sgt. F. R. GILBEY, R.A.F.V.R., No. 77 Sqn.
Flt. Sgt. T. H. GRAHAM, R.A.F.V.R., No. 115 Sqn.
Flt. Sgt. M. F. GRAY, R.C.A.F., No. 419 (R.C.A.F.) Sqn.
Flt. Sgt. G. M. HAYLETT, R.A.F.V.R., No. 100 Sqn.
Flt. Sgt. P. F. HIGGINS, R.A.F.V.R., No. 192 Sqn.
Flt. Sgt. R. H. HOOLEY, R.A.F.V.R., No. 196 Sqn.
Flt. Sgt. A. J. JANES, R.C.A.F., No. 10 Sqn.
Flt. Sgt. J. JENKINSON, R.A.F.V.R., No. 76 Sqn.
Flt. Sgt. L. C. JEWSBURY, R.A.F.V.R., No. 10 Sqn.
Flt. Sgt. W. J. JONES, R.A.F.V.R., No. 10 Sqn.
Flt. Sgt. T. H. KNIGHT, R.A.F.V.R., No. 156 Sqn.
Flt. Sgt. T. LYNN, R.A.F.V.R., No. 106 Sqn.
Flt. Sgt. J. S. MATTHEWS, R.A.F.V.R., No. 138 Sqn.
Flt. Sgt. S. B. MATTICK, R.A.F.V.R., No. 61 Sqn.
Flt. Sgt. (now P/O) E. M. MCALISTER, R.A.A.F., No. 101 Sqn.
Flt. Sgt. S. A. MILLER, R.A.F.V.R., No. 35 Sqn.
Flt. Sgt. P. J. MOLONEY, R.A.F.V.R., No. 466 (R.A.A.F.) Sqn.
Flt. Sgt. E. D. O'REILLY, R.N.Z.A.F., No. 155 Sqn.
Flt. Sgt. J. E. PALMER, R.A.F., No. 10 Sqn.
Flt. Sgt. D. J. PARK, R. A. F., No. 156 Sqn.
Flt. Sgt. S. A. PEPWORTH, R.A.F.V.R., No. 106 Sqn.
Flt. Sgt. J. R. PETRIE-ANDREWS, R.A.F.V.R., No. 35 Sqn.
Flt. Sgt. Q. A. RICHARDSON, R.A.A.F., No. 460 (R.A.A.F.) Sqn.
Flt. Sgt. M. L. ROWLAND, R.A.F.V.R., No. 101 Sqn.
Flt. Sgt. W. J. SIMPSON, R.A.F.V.R., No. 35 Sqn.
Flt. Sgt. H. U. SOWDEN, R.A.F.V.R., No. 196 Sqn.
Flt. Sgt. D. W. STORMS, R.C.A.F., No. 101 Sqn.
Flt. Sgt. F. TURNER, R.A.F.V.R., No. 83 Sqn.
Flt. Sgt. H. G. WEBB, R.A.F.V.R., No. 196 Sqn.
Flt. Sgt. (now P/O.) R. G. WHITE, R.A.A.F., No. 460 (R.A.A.F.) Sqn.
Flt. Sgt. R. WILLIAMSON, R.A.F.V.R., No. 196 Sqn.
Flt. Sgt. C. H. WOLSTENHOLME, R.A.F.V.R., No. 7 Sqn.
Flt. Sgt. J. H. WRIGHT, R.A.F., No. 83 Sqn.
Sgt. F. O'NEILL, R.A.F.V.R., No. 18 Sqn.
Sgt. J. F. WILES, R.A.F.V.R., No. 209 Sqn.
Flt. Sgt. W. D. WHITEHEAD, R.N.Z.A.F., No. 75 (N.Z.) Sqn.
Sgt. T. GUY, R.A.F.V.R., No. 218 Sqn.
Sgt. M. M. MITCHEM, R.A.F., No. 218 Sqn.
Flt. Sgt. F. J. A. W. BURNETT, R.A.F.V.R., No. 70 Sqn.
Flt. Sgt. E. CHEEK, R.A.F., No. 224 Sqn.
Flt. Sgt. E. HANKEY, R.A.A.F., No. 3 Sqn.
Flt. Sgt. E. J. KEMPTON, R.A.F., No. 228 Sqn.
Flt. Sgt. W. K. OWEN, R.A.F., No. 224 Sqn.
Flt. Sgt. R. C. PRESCOTT, R.A.F., No. 540 Sqn.
Sgt. T. DICKINSON, R.A.F.V.R., No. 148 Sqn.
Sgt. J. L. DOYLE, R.A.F.V.R., No. 210 Sqn.
Sgt. E. K. MARTIN, R.A.F.V.R., No. 148 Sqn.
Sgt. A. McFARLANE, A.A.F., No. 228 Sqn.
Sgt. A. C. CLEGG, R.A.F.V.R., No. 156 Sqn.
Sgt. T. STOCKS, R.A.F.V.R., No. 156 Sqn.
Sgt. K. B. FORBES, R.A.F.V.R., No. 682 Sqn.
Flt. Sgt. R. J. DAFFEY, R.A.F.V.R., No. 77 Sqn.
Sgt. R. CURRIE, R.A.F.V.R., No. 199 Sqn.
Sgt. S. W. FARR, R.A.F.V.R., No. 51 Sqn.
Sgt. G. KELLY, R.A.F.V.R., No. 51 Sqn.

THE KING has been graciously pleased to approve the following awards to members of the Royal Australian Air Force:—

Air Force Cross

Flt. Lt. F. R. MAGUIRE, awarded with effect from August 31, 1943.
Flt. Lt. K. V. ROBERTSON.

Award of Foreign Decoration

THE KING has granted unrestricted permission for the wearing of the undermentioned decoration conferred upon the officer indicated in recognition of valuable services rendered in connection with the war:

Conferred by His Majesty the King of Norway

Norwegian War Cross

Act. Wing Cdr. P. G. JAMESON, D.S.O., D.F.C., R.A.F.

Roll of Honour

Casualty Communiqué No. 303.

THE Air Ministry regrets to announce the following casualties on various dates. The next of kin have been informed. Casualties "in action" are due to flying operations against the enemy; "on active service" includes ground casualties due to enemy action, non-operational flying casualties, fatal accidents and natural deaths.

Of the names in this list, 89 are second entries giving later information of casualties published in earlier lists.

Royal Air Force

KILLED IN ACTION.—Sgt. A. G. Luxford; F/O. A. J. Organ; Sgt. D. J. Rose.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Sgt. C. Avery; Flt. Lt. F. G. Baker; Sgt. E. Berry; Sgt. C. Calvert; Sgt. W. A. Dawe; Sgt. W. J. Harris; Sgt. D. G. Hobbs; Sgt. J. Howe; Sgt. W. L. Jones, Sgt. R. C. Lamerton; Sgt. I. W. Lineker; Wing Cdr. G. F. Longfield; Flt. Sgt. C. Mitchell; Sgt. W. H. Mc ger; Sgt. A. J. Perrin, D.F.M.; Act. Flt. Lt. C. W. M. Powell; Flt. Sgt. E. P. Presland; Sgt. K. H Pugh; Sgt. P. J. Rose; Flt. Sgt. W. J. Rose, D.F.M.; Sgt. A. Sandow; Sgt. A. H. J. Searle; Flt. Lt. R. M. Smith, D.F.C.; Flt. Sgt. J. D. W. Stenhouse; Wing Cdr. H. M. Styles, D.S.O.; F/O F. E. Townsend; Sgt. M. R. Wallis; Sgt. J. W. Wheildon; P/O. R. S. Wilson, D.F.M.; Sgt. H. Wood; Sgt. W. C. Yetton.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Sgt. L. C. Andrews; Sgt. D. W. Archibald; Sgt. J. G. Ashton; P/O. K. D. Babington-Browne; Sgt. J. E. Brewster; Flt. Sgt. J. D. Brinkhurst; Sgt. E. Carr; Sgt. G. T. Chisholm; Sgt. R. S. Darke; Act. Flt. Lt. E. A. Davies; Sgt. G. G. Dobson; Sgt. R. A. Edmonds; Flt. Sgt. D. Forbes; Sgt. P. D. Fowler; Sgt. A. C. Girdlestone; Sgt. J. W. Gould; Sgt. W. E. Greasley; Flt. Sgt. V. Greenwood; Sgt. R. Gregg; P/O. B. J. Gunter; Flt. Sgt. M. H. Hale; Flt. Sgt. F. Halliday; Flt. Sgt. R. C. Hovers; Sgt. W. Hynd; Sgt. F. A. Jones; Sgt. A. G. Langton; P/O. I. F. Leng; Sgt. A. McKinlay; Sgt. S. G. L. Marlin; Sgt. T. Mellors; Act. Flt. Lt. R. F. Millns; Flt. Sgt. G. Mitchell; Sgt. G. F. Mitchell; Sgt. C. Neilson; Flt. Sgt. R. G. Peters; F/O. F. Richards; Sgt. J. W. Schofield; Sgt. E. Shaw; Sgt. W. H. Shipp; Sgt. A. G. Short; Sgt. A. D. Slade; Sgt. S. G. Smith; Sgt. T. C. Somerville; Sgt J. Stammers; Sgt. A. Stansfield; Sgt. E. A. Steed; Flt. Sgt. J. Taylor;

DOUBLE D.F.M. Flt. Sgt. Pilot S. P. Clark (left) and Sgt. Air Gunner A. W. Dowsett, both of the same aircrew, who have been awarded the D.F.M.

Flt. Sgt. A. H. Threlfall; Sgt. B. Torrance; Sgt. R. Twiddy; Sgt. L. E. Webber; P/O. J. D. Willson.

WOUNDED OR INJURED IN ACTION.—F/O. G. G. Adams; P/O. G. R. Chaffe; Sgt. H. Mehmed.

MISSING, BELIEVED KILLED IN ACTION.—F/O. R. H. Andrews; F/O. F. B. Biddulph; Flt. Sgt. A. R. Bonnick; Sgt. A. Bryan; Sgt. F. R. Davies; F/O. H. M. Etherington; P/O. J. Falejevas; P/O P. Hobbs; Sgt. F. Y. Howes; F/O. L. W. Kirby; F/O R. A. Mackenzie; Sgt. J. Maden; P/O. R. G. Pearcey; Sgt. E. H. Pegg; P/O. R. W. Peters, D.F.M.; Flt. Sgt. F. Pollard; Sgt. R. Rushton; F/O. J. S. Townsend, B.E.M.; Sgt. J. S. White.

MISSING.—Flt. Lt. J. T. Anderton; F/O. S. Barrow; W/O. A. P. Bates; Act. Flt. Lt. W. H. Berg; F/O. J. S. Blunt; Sgt. A. Brombey; Sgt. R. Carlon; P/O. G. H. Clarke; F/O. S. J. Cougdon, D.F.M.; F/O. M. H. F. Cooper; Sgt. J. C. Cunningham; Sgt. G. R. Cutter; F/O. J. T. Davidson; Sgt. G. W. D. Dean; Sgt. K. N. Donald; F/O. A. Fisher; Sgt. A. M. Fox; P/O. K. Gibson; Wing Cdr. C. L. Gomm, D.S.O., D.F.C.; F/O. K. A. Gough; Sqn. Ldr. F. C. Griffiths, A.F.C.; Sgt. E. A. Hall; Sgt. C. Harrison; Sgt. J. R. Harrison; Sgt. T. McL. Hay; F/O. J. D. Hotson; Sgt. G. C. Jeffreys; Sgt. R. L. Jones; F/O. A. L. Kellow; Sgt. J. Kirkman; F/O. R. T. E. Latham; Sgt. H. W. Lilley; Sgt. A. E. Lloyd; Flt. Sgt. A. C. Ludgater; Sgt. J. McAdam; Sqn. Ldr. A. S. MacIntyre; Sgt. H. Maitland; Sgt. K. E. Marriott; Act. Flt. Lt. S. G. Matkin, D.F.C.; Sgt. J. H. Miller; Sgt. K. E. Moulding; P/O. J. B. Paterson; F/O. T. J. Phillips; P/O. H. N. Pritchard; Sgt. C. J. Purcell; P/O. W. H. Richards; Sgt. N. J. Shergold; F/O. E. D. Skitt; F/O. J. Small; Sgt. R. Thornton; Flt. Sgt. V. A. Weaver; Sgt. A. Wiltatmore; Sgt. R. W. Wilcockson; Act. Flt. Lt. L. K. Williams; F/O. K. J. B. Wilson.

MISSING, BELIEVED KILLED ON ACTIVE SERVICE.—A/C.2 A. J. Clark; A/C.2 R. B. Watson.

KILLED ON ACTIVE SERVICE.—L.A/C. A. W. J. Barbey; Sgt. H. D. Chapman; Sgt. J. D. Clarke; L.A/C. S. Coe; L.A/C. D. Cooper; A/C.1 H. Croft; L.A/C. R. Dowds; F/O. J. S. Greengrass; Sgt. N. M. Hansford; Flt. Sgt. R. J. Hutton; A/C.1 J. J. McCarthy, B.E.M.; L.A/C. F. W. A. Mitchener; Sgt. H. G. Montgomery; F/O. D. W. Noad; A/C.2 R. S. Pearson; F/O. A. W. Robertson; Sgt. H. Sabini; Flt. Sgt. J. F. H. Sanders.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED ON ACTIVE SERVICE, NOW PRESUMED KILLED ON ACTIVE SERVICE.—Flt. Sgt. T. F. McCarthy.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED ON ACTIVE SERVICE.—Sgt. P. L. Hauser; Sgt. J. Johnson.

PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED ON ACTIVE SERVICE.—L.A/C. P. Hunt; L.A/C. A. F. Mawby; L.A/C. S. R. Williams.

WOUNDED OR INJURED ON ACTIVE SERVICE.—L.A/C. D. Antaki; L.A/C. L. V. D. Ellinor; L.A/C. W. Grayson; Flt. Sgt. R. Gristwood; L.A/C. N. J. Hill; Sgt. J. Hirst; Cpl. H. Humber; A/C.1 T. J. A. Jones; Cpl. G. L. Kane; Cpl. A. Manion; L.A/C. T. J. Morgans; A/C.1 R. Pinder; L.A/C. H. A. Seaman; L.A/C. H. Steers; L.A/C. G. W. Stringer; Sgt. E. H. Tiernan; L.A/C. H. R. V. Wallis; L.A/C. J. Wightman.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—L.A/C. M. C. Arkell; L.A/C. E. H. Dipple; L.A/C. J. Hayden; L.A/C. L. R. Jarvis; F/O. G. Johnstone; Cpl. C. H. Leaver; L.A/C. B. Morgan; A/C.1 G. H. Newman; L.A/C. J. Parkes; Act. Cpl. W. Rogerson; L.A/C. H. A. Russell.

DIED ON ACTIVE SERVICE.—L.A/C. P. G. Black; L.A/C. R. J. Carter; L.A/C. J. G. Davis; A/C.1 J. Delahunty; Sgt. G. E. Downton; L.A/C. H. Duckworth; A/C.2 R. E. Fawcett; P/O. I. G. F. W. Hamilton; L.A/C. J. D. Mohring; Act. Flt. Lt. G. W. Nickerson, M.M.; P/O. R. W. Norman; L.A/C. R. G. V. Parsons; L.A/C. R. M. D. Petrie; A/C.1 D. L. Phillips; L.A/C. F. E. Porter; L.A/C. A. J. Pryor; L.A/C. A. E. Stock; Sqn. Ldr. S. Wickenden; L.A/C. J. V. Young.

Women's Auxiliary Air Force

DIED ON ACTIVE SERVICE.—A/CW.2 E. E. Warren.

Royal Australian Air Force

KILLED IN ACTION.—Flt. Sgt. J. R. Kraemer; F/O. J. Smithers.

WOUNDED OR INJURED IN ACTION.—F/O. S. W. Burney.

DIED OF WOUNDS OR INJURIES RECEIVED IN ACTION.—Flt. Sgt. R. H. Haskins.

MISSING.—Flt. Sgt. A. L. Bathurst; W/O. C. B. Campbell; W/O. J. H. Dugan; P/O. V. B. Finn; Flt. Sgt. E. H. Gunders; Flt. Sgt. K. W. Longmore; W/O. L. L. McKenny; F/O. A. H. Reardon; Flt. Sgt. L. G. Simpson; Flt. Sgt. R. J. Taylor; F/O. F. T. Thornley.

MISSING, BELIEVED KILLED ON ACTIVE SERVICE.—Flt. Sgt. C. J. Jamison.

KILLED ON ACTIVE SERVICE.—P/O. H. M. Beyer; Flt. Sgt. F. I. Hardaker; Flt. Sgt. A. D. Riordan; Sgt. L. G. Sellen; F/O. A. J. White.

Royal Canadian Air Force

WOUNDED OR INJURED IN ACTION.—F/O. S. T. Smith.

MISSING, BELIEVED KILLED IN ACTION.—Sgt. H. Clement; P/O. G. N. Goodwin.

MISSING.—Flt. Sgt. A. A. Balcombe; F/O. J. R. Carswell; F/O. M. I. Fraleigh; F/O. A. J. F. Hay; Flt. Sgt. R. G. Needham; P/O. J. W. O'Hara; Flt. Sgt. J. Perkins; P/O. G. N. Rattee; Act. Flt. Lt. J. R. Sterne, D.F.C.; Sgt. L. M. Stormer; F/O. R. P. Swallow; F/O. C. A. Tindall.

KILLED ON ACTIVE SERVICE.—Flt. Sgt. A. A. Johnston; Sgt. E. S. McCuaig; Flt. Sgt. T. Main; P/O. S. L. Pettingdale; Flt. Lt. B. W. Pritchard; F/O. E. E. Smith; F/O. H. M. Tarver; Flt. Lt. A. G. Tatton; P/O. N. J. Tuchtie; Flt. Sgt. H. C. Ward.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—Sgt. V. J. Surbey.

FRONT LINE COMFORT: The officers' mess of a Spitfire squadron at Salerno. The furniture has been given by local inhabitants.

Royal New Zealand Air Force

MISSING, BELIEVED KILLED IN ACTION.—Sgt. A. G. Bennett; Sgt. L. J. Frost; F/O. I. Marinovich; Sgt. T. J. Soper; F/O. L. A. Trigg, D.F.C.

MISSING.—Flt. Sgt. C. G. Hamilton; Act. Flt. Lt. R. C. C. Taylor; F/O. J. Whyte.

KILLED ON ACTIVE SERVICE.—Flt. Sgt. J. F. Simmons.

South African Air Force

KILLED IN ACTION.—Lt. O. L. Dugmore.

Casualty Communique No. 304.

Of the names in this list, 99 are second entries giving later information of casualties published in earlier lists.

Royal Air Force

KILLED IN ACTION.—Sgt. L. Brewis; F/O. C. F. Cropper; Sgt. J. T. Farrelly; Sgt. W. H. Harris; F/O. R. M. Kildea; W/O. D. N. Lowe; Sgt. G. L. Plume; Sgt. J. S. Rippon; F/O. D. W. Roberts; Sgt. L. Sabine; Sgt. E. B. H. Wells.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Sgt. A. E. Blackwell; Sgt. R. Brookes; Sgt. R. E. Dean; Act. Sqn. Ldr. J. L. Fletcher, D.F.M.; P/O. J. R. Thompson; Sgt. L. A. Trinder; Flt. Lt. A. T. Wheatley; Sgt. E. C. B. Williams; Sgt. R. Williams.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—F/O. K. A. Adam; Act. Flt. Lt. C. G. S. Bain; Sgt. J. H. Bakewell; Sgt. D. J. Ball; P/O. F. A. Beane; Sgt. D. W. Belsham; Sgt. F. Bestwick; Sgt. F. A. Boese; Sgt. J. E. Bonson; Sgt. A. Briggs; Sgt. E. A. O. Campbell; Sgt. D. G. Davies; Flt. Lt. A. G. Espley; Sgt. A. P. D. Francis; Sgt. D. D. Hayward; F/O. W. Henry; Sgt. F. S. Higginbottom; Sgt. R. A. Hird; Flt. Sgt. L. G. Hudson; Flt. Lt. G. H. Jackman; Sgt. H. Kay; Sgt. J. J. Kellett; Sgt. F. C. Kelly; Sgt. J. A. Kelly; Sgt. L. A. Leadbitter; Flt. Sgt. H. V. Le Dieu; Sgt. J. Lee; Sgt. K. R. Lees; Sgt. W. Lewis; Sgt. A. J. Long; F/O. T. Lonsdale; Sgt. B. McAuley; F/O. R. G. McCracken; Sgt. H. McCullough; Sgt. A. J. Marshall; Flt. Lt. A. L. Mitchell; Sgt. C. H. Nadin; F/O. L. G. Newman; Sgt. J. Patton; Sgt. J. G. Powell; Sgt. J. J. Redmond; Sgt. A. A. Richardson; Sgt. T. R. D. Shirley; Sgt. J. D. Short; Sgt. R. T. Southcott; Sgt. A. R. Spencer; Sgt. D. G. Thomas; F/O. D. V. Varian; Sgt. M. P. Vaughan; Sgt. E. Walker; Sgt. F. L. D'O. Walters; Sgt. G. H. Wilson; Sgt. J. F. L. Wilson.

WOUNDED OR INJURED IN ACTION.—F/O. D. C. Hartung; F/O. N. A. H. Lyes; F/O. C. G. Pascoe.

MISSING, BELIEVED KILLED IN ACTION.—Flt. Sgt. R. C. Bradley; F/O. K. T. Every; Sgt. H. T. French; Sgt. R. Hunter; P/O. G. J. Kerr; Sgt. L. Letts; P/O. V. Lower; F/O. E. H. McCormack; F/O. P. R. McIntosh; Sgt. J. H. Naylor; Sgt. R. H. Reay; Sgt. J. C. D. Riddell; Sgt. A. Tice.

MISSING.—Sgt. S. E. Baber; Sgt. P. S. Barnett; Sgt. T. B. Barrie; Flt. Sgt. S. E. Birkett; Sgt. R. G. Blood; Sgt. G. W. Bloomfield; Sgt. A. C. Brand; Sgt. A. C. Brooksbank; Flt. Sgt. R. O. Chester; Flt. Sgt. J. Clarke; P/O. E. J. Cook; Sgt. A. M. Cowgill; Sgt. P. W. Cramb; Flt. Sgt. D. S. Croxford; P/O. A. W. Davies; Sgt. P. T. Davies; F/O. L. G. Davis; P/O. R. L. H. Dench; Sgt. R. D. Deugard; Sgt. E. W. Dredge; Sgt. J. Erskine; Sgt. S. W. Evans; Sgt. W. A. Eyart; Flt. Sgt. D. Fielden; Flt. Sgt. E. J. A. Ford; Sgt. C. B. Francis; P/O. A. E. B. Freeman; F/O. H. Furniss-Roe; Flt. Sgt. F. B. Garrett; Sqn. Ldr. A. R. Gibbes, D.F.C.; P/O. J. C. Giles; Sgt. H. J. Graham; Sgt. F. Grey; Sgt. C. Haddock; P/O R. H. W. Harris; Sgt. G. B. Hasdell; Sgt. R. G. Hinton; Sgt. L. J. Hopkins; Sgt. W. H. Humphrey; F/O. E. E. Huxter; Sgt. R. W. Jaques; P/O. E. James; L.A/C. A. G. John; F/O. M. P. Johnson; Sgt. J. J. Knight; Sgt. K. E. Lamond; Wing Cdr. E. J. Little, D.F.C.; Sgt. T. H. Loke; Sgt. W. Lowe; Sgt. H. J. McAdam; F/O. R. G. McInnes; Sgt. L. Marsden; Sgt. A. J. Mason; Sgt. N. J. Meen; Flt. Sgt. E. H. Merlin; Sgt. A. J. H. Millin; Act. Flt. Lt. M. H. Parry; Sgt. A. J. Pearce; Sgt. J. C. Pratt; W/O. J. R. Prockter; F/O. R. G. Rainford; Act. Sqn. Ldr. A. S. Raphael; Sgt. F. D. Rex; Sgt. E. Saunders; Sgt. G. Smith; Sgt. V. Smith; Sgt. W. J. R. Soulsby; Sgt. G. W. Stokes; Sgt. C. W. Sweeting; Sgt. S. R. Tattersall; Sgt. A. E. Taylor; F/O. D. W. B. Taylor; Sgt. D. H. Walshaw; F/O. J. M. Warren; Sgt. W. D. Whitfield; Sgt. F. S. Williams; Sgt. R. Williams.

KILLED ON ACTIVE SERVICE.—Sgt. A. J. Allan; Act. Sqn. Ldr. H. M. Allen; Sgt. T. C. Ashley; P/O. J. Corcoran; Sgt. L. W. Cordey; Sgt. F. Cosford; Sgt. M. Dobbie; P/O. R. W. B. Frost; P/O. H. Gray; Act. Flt. Lt. J. W. Gray-King; Sgt. H. L. Griffiths; Sgt. N. J. Hart; Sgt. G. M. Jackson; F/O. J. H. Johnson; Sgt. D. Maciver; Sgt. T. R. McMeekan; Sgt. F. J. Manley; Sgt. J. Marsh; F/O. R. S. Meldrum; Sgt. J. J. O'Brien; Sgt. P. C. Parrott; Sgt. C. E. Petre; Sgt. R. S. Pocock; Sgt. D. C. Ravine; Sgt. F. D. Read; Sgt. J. H. Townsend; F/O. R. F. Walker; Sgt. J. P. Wall; Sgt. J. Waugh; Sgt. D. L. H. Wooster.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED ON ACTIVE SERVICE, NOW PRESUMED KILLED ON ACTIVE SERVICE.—Cpl. J. M. Anthony; Flt. Sgt. L. Armstrong; Sgt. T. A. Dakin; Cpl. E. D. Davies; Cpl. R. T. Humphreys; L.A/C. R. M. McCreadie; Sgt. G. C. Mackay; W/O. W. F. V. B. Pine; L.A/C. W. R. B. Stoddart; L.A/C. S. W. Tye; Flt. Sgt. F. J. Young.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED ON ACTIVE SERVICE.—W/O. J. A. Cook; Sgt. D. V. Corrigan; Sgt. R. Harding; Sgt. N. J. Madgett; Sgt. E. Mannering; Sgt. L. W. Simkiss; Sgt. R. E. Thompson.

WOUNDED OR INJURED ON ACTIVE SERVICE.—Act. Flt. Lt. W. A. M. B. Stewart.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—P/O. P. E. Falkner; Sgt. D. V. Fentiman; Sgt. K. Pumphrey.

DIED ON ACTIVE SERVICE.—Cpl. W. G. Green; A/C.2 H. Jackson; L.A/C. F. H. Payne; A/C.2 L. A. Saunders; Cpl. E. K. Sutherland.

Women's Auxiliary Air Force

WOUNDED OR INJURED ON ACTIVE SERVICE.—Assist. S/O. F. M. Edmunds.

DIED ON ACTIVE SERVICE.—A/CW.2 D. M. Hudson.

Royal Australian Air Force

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Sgt. J. H. Ball; Act. Flt. Lt. C. A. Giles, D.F.C.; Sgt. J. H. Lovell, D.F.M.; P/O. A. R. Noseda, D.F.C.; Sgt. F. H. Paterson.

MISSING.—Sgt. A. R. Aldridge; Flt. Sgt. H. E. Burbidge; F/O. V. D. W. Collins; Flt. Sgt. R. A. Gibbs; Sgt. W. P. Greatz; Flt. Sgt. A. H. Hill; F/O. W. N. Hill; Flt. Sgt. K. M. Meldrum; Sgt. N. H. Orford; Act. Flt. Lt. H. W. Skinner; Sgt. W. Slater; F/O. R. R. Swinson

SERVICE

KILLED ON ACTIVE SERVICE.—Flt. Sgt. J. A. Johnston.

Royal Canadian Air Force

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—P/O. J. C. Jackes; Sgt. W. G. Kirby; Flt. Sgt. G. W. W. Peck, D.F.M.; Sgt. R. F. Strain; Sgt. W. Thirde.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. D. W. Congdon; Sgt F. X. J. Dunajski; Sgt. F. J. Hogan; F/O. J. R. Kee; P/O. J. D. Lindsay.

PREVIOUSLY REPORTED MISSING, NOW REPORTED DIED OF WOUNDS OR INJURIES RECEIVED IN ACTION.—Flt. Sgt. H. A. Harris.

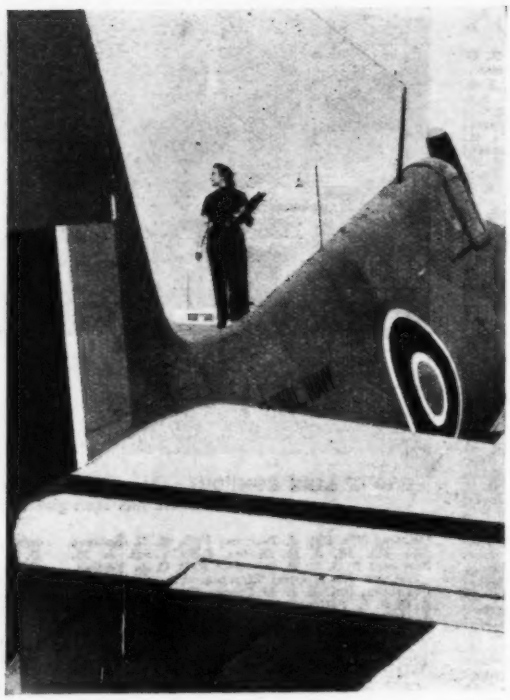
MISSING, BELIEVED KILLED IN ACTION.—P/O. J. V. Gibson, D.F.C.; Sgt. A. A. Thompson; F/O. R. H. Tierney.

MISSING.—Sgt. N. G. Betts; Sgt. W. W. Blackmore; F/O. E. S. Brenton; F/O. A. Brown; Sgt. C. R. Byers; F/O. R. G. Carter; Sgt. W. B. F. Climie; F/O. E. W. Dickinson; Sgt H. B. Ebbers; F/O. E. L. Fairweather; Sgt. G. S. Feakes; Sgt. W. H. Garbutt; Sgt. T. K. Green; Sgt. B. B. Harrison; P/O. R. S. Harrison; F/O. R. T. Heeney; P/O. L. T. J. Kelly; Sgt. W. H. Ledford, D.F.M.; P/O. A. B. Long; Sgt. E. A. Morgan; Sgt. W. J. Poulin; Sgt. N. G. Schultz.

KILLED ON ACTIVE SERVICE.—F/O. M. W. Bonner; Sgt A. E. Gilverson; Sgt. E. J. E. Beaudry; P/O. L. Fullerton; Sgt. A. S. Clegg; P/O. G. W. Hirtle; P/O. A. H. Peters; Flt. Sgt. J. H. Clancy; Flt. Sgt. R. A. Clark; P/O. R. C. Dalgleish; Sgt. W. J. Shaver.

WOUNDED OR INJURED ON ACTIVE SERVICE.—Flt. Sgt. G. O. Buckman.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—Sqn. Ldr. F. H. Boulton.



BELLE IN THE CAT: A Wren checking out one of the new F.A.A. Hellcats.

Royal New Zealand Air Force

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—P/O. A. J. Scott.

MISSING, BELIEVED KILLED IN ACTION.—P/O. W. D. Caldwell.

MISSING.—F/O. A. V. Bary; P/O. F. D. Clark; F/O. N. W. Springer; F/O. M. G. Sutherland.

South African Air Force

PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED ON ACTIVE SERVICE.—Lt. M. A. Cotterell; Air Mech. J. A. Jones.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—Act. Maj. H. J. Bolt.

Casualty Communique No. 305.

Of the names in this list, 104 are second entries giving later information of casualties published in earlier lists.

Royal Air Force

KILLED IN ACTION.—Sgt. J. Blackett; Flt. Lt. R. E. Davies; Sgt. A. W. Evans; Sgt. J. R. Forrest; Sgt. E. F. Jarrett; F/O. T. F. Joyce; Sgt. T. L. Mincher; Sgt. A. Paterson; Sgt. G. S. Roadley; F/O. G. C. Rolls; Sgt. J. K. Watson; Act. Sqn. Ldr. D. C. Wellburn.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Sgt. F. A. Bandeen; P/O. A. E. Fisher; Sgt. T. S. McStay; Sgt. K. Roberts.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Sgt. A. F. Bentley; Sgt. W. A. F. Brannon; Sgt. F. A. Broom; Sgt. G. Bull; Sgt. P. B. J. Butcher; Sgt. J. C. Caldwell; Act. Sqn. Ldr. P. W. M. Carlyon, D.F.C.; Sgt. L. Carr; Sgt. R. Carson; P/O. J. C. A. Clarke; Flt. Sgt. R. A. Colehan; Act. Flt. Lt. C. Dent; P/O. M. K. Eldrid; Sgt. F. S. Fish; Sgt. K. H. Godbold; P/O. R. M. Gray; Sgt. T. W. Grisedale; Flt. Sgt. K. G. M. Hale; P/O. A. Hampshire; Sgt. D. E. J. Hardy; Sgt. J. E. Humphreys; Sgt. G. W. Jackson; Sgt. W. H. P. Kelleher; Sgt. J. L. Kemp; P/O. B. C. H. King; Sqn. Ldr. D. G. Long, D.F.C., A.F.C.; Sgt. J. McDonald; Flt. Lt. J. M. MacDonald; Sgt. B. Martin; Sgt. G. E. Marwick; Sgt. E. L. Moore; P/O. L. J. Musselwhite; Flt. Sgt. S. Nicholson; Sgt. C. J. Pope; Sgt. J. Porter; Sgt. J. D. Quilter; P/O. F. C. Reed; Sgt. N. A. Revitt; P/O. A. G. Richards; F/O. E. W. G. Rosam, D.F.C., D.F.M.; Sgt. R. T. C. Sharp; P/O. J. K. Stewart; Sgt. F. Taylor; Sgt. A. K. Taylor-Thomas; Sgt. L. Thompson; Flt. Sgt. G. H. Thornley; Sgt. F. L. Tidball; P/O. E. Whitelock; Sgt. D. T. B. Williams; Sgt. F. J. Windram.

WOUNDED OR INJURED IN ACTION.—Sgt. B. G. Bennett; Sgt. F. Dallman; Sgt. W. P. Knight; Sgt. J. J. Toper.

MISSING, BELIEVED KILLED IN ACTION.—Sgt. S. J. Banting; P/O. J. Bradford; Sgt. R. W. Horwood; P/O. T. J. Leadley; P/O. K. W. McTernaghan; P/O. A. Massie; P/O. S. Norris; P/O. R. S. Payne; Sgt. W. A. Peers; Sgt. J. Punter; Sgt. D. J. Purcell; P/O. G. P. Read; F/O. C. R. G. Rollings; P/O. F. R. Sanderson; P/O. J. A. Spencer; F/O. T. H. Tabberer; Sgt. E. Wallen; Sgt. T. F. Watkins; Sgt. J. I. Winchurch.

MISSING.—Sgt. F. K. Alcock; Sgt. D. J. Atkinson; Sgt. D. Bailey; Flt. Lt. G. F. Ball; Flt. Sgt. H. A. Bate; Sgt. A. W. Beard; Sgt. J. L. Bloxham; Sgt. D. D. Boyd; Flt. Sgt. A. Brannigan; Sgt. H. F. Burrett; P/O. M. P. Callaway; F/O. P. Carling; Sgt. H. Cartwright; Flt. Sgt. W. F. Catley; Sgt. J. S. Caton; Sgt. S. W. Chapman; F/O. H. A. Clark; Sgt. R. W. Cornelius; Flt. Sgt. N. Cresswell; Sgt. W. G. H. Dadge; Sgt. G. R. Darvill; Sgt. V. W. Davies; Sgt. W. E. Dixon; Sgt. D. A. G. Edwards; Sgt. G. R. Elks; P/O. A. E. Emans; P/O. G. E. Fraser; Flt. Sgt. W. F. Freeze; P/O. J. H. Gielstrup; Sgt. T. I. Goodwin; Sgt. J. J. Gratton; Sgt. J. Green; Sgt. L. Green; Sgt. S. D. Harris; Flt. Lt. D. Haywood; F/O. J. Hillen; Sgt. H. K. Hollidge; Flt. Sgt. P. R. Humphries; Sgt. M. Hunter; F/O. E. Hyett; Sgt. N. W. Jewell; Sgt. A. D. Johnstone; P/O. F. N. Lawrence; P/O. A. Lens; F/O. W. W. Locke; Sgt. J. McCallum; Sgt. G. D. Mair; Sgt. C. K. Marsh; Sgt. R. C. Mason; Sgt. J. E. H. Morton; F/O. J. Nesden; Sgt. D. J. Nettle; Sgt. J. E. Nicholson; Sgt. E. S. R. Norgrove; Sgt. W. Palmer; Sgt. C. R. Parish; Sgt. J. M. Parr; P/O. W. W. Pattinson; Sgt. A. H. Peadon; Sgt. M. Pearce; Sgt. G. Pearson; P/O. P. W. Phillips; Sgt. J. E. W. Pimm; Sgt. H. S. H. Quinn; Sgt. A. A. Reeves; Sgt. R. Rodgers; Sgt. T. P. Shelmerdine; Flt. Sgt. C. H. Silvester; Sgt. K. W. Smith; Sgt. D. R. Spencer; Sgt. C. C. Stenning; Sgt. H. T. Street; Sgt. A. G. Templeton; P/O. K. C. Turp; Flt. Sgt. W. P. Ward; Sgt. H. W. J. Ware; Sgt. H. E. Warren; Sgt. C. F. Webb; Sgt. J. Whittaker; F/O. J. E. T. Wilkinson; Sgt. W. P. Williams; Sgt. F. R. Wills; Sgt. M. E. Windsor; Sgt. F. E. Worsley; Sgt. F. S. Wright.

MISSING, BELIEVED KILLED ON ACTIVE SERVICE.—Sgt. G. Duncan; F/O. J. R. Keevil; F/O. R. Lund; L.A/C. R. Morgan; Sgt. F. Plows; L.A/C. D. Sutherland; F/O. S. G. Wallis; Sgt. P. Walmsley.

KILLED ON ACTIVE SERVICE.—Act. Sqn. Ldr. E. R. M. Appleton; Sgt. W. Bradshaw; P/O. K. Brookman; Flt. Lt. L. R. C. Cartwright; Sgt.

AVIATION

S. J. Datson; Sgt. R. Davie-Speirs; L.A/C. D. W. Evans; Sgt. W. Frearson; P/O. S. J. Gordon; Flt. Sgt. V. G. Gowers; Sgt. D. O. Hardgreaves; Sgt. G. M. Heppinstall; Sgt. G. Howard; P/O. B. W. Jobling; P/O. J. M. McIver; Act. Flt. Lt. C. Metcalfe; Cpl. P. R. Oliver; Sgt. T. Stearman; P/O. F. T. Weston; Sgt. L. Yealland.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED ON ACTIVE SERVICE.—L.A/C. S. S. Suriyapillai.

WOUNDED OR INJURED ON ACTIVE SERVICE.—F/O. G. L. Bruce.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—L.A/C. W. F. S. Ridout.

DIED ON ACTIVE SERVICE.—A/C.2 D. Burkinshaw; A/C.2 J. F. Harris; F/O. R. de L. Holden; L.A/C. G. F. Lodge; L.A/C. W. Logie; L.A/C. J. J. McAleer; Act. Cpl. Y. C. O'Donnel; L.A/C. L. L. Thompson; A/C.1 J. Wilson.

Royal Australian Air Force

KILLED IN ACTION.—F/O. R. L. Clarke.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Sgt. L. F. Samson.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Sgt. C. F. Allen; Act. Sgt. D. C. Devlin; Sgt. A. G. Duxbury; Flt. Sgt. R. D. Gannon; Sgt. H. M. Hawkins; F/O. T. E. Jones; Sgt. J. C. Smithson; Sgt. D. D. Trood.

MISSING, BELIEVED KILLED IN ACTION.—F/O. A. J. Birtles.

MISSING.—P/O. A. J. L. Sedunary.

MISSING, BELIEVED KILLED ON ACTIVE SERVICE.—Flt. Sgt. J. A. Kingsmill.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED ON ACTIVE SERVICE.—Sgt. R. L. D. Phair.

Royal Canadian Air Force

KILLED IN ACTION.—Sgt. I. J. Clark.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Sgt. G. H. Corrie; P/O. S. Danahy; Sgt. C. F. Leach; Sgt. J. H. Morris; P/O. O. H. Skelton; Sgt. T. C. Smith.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. R. H. Baldock; Sgt. W. S. Beale; Flt. Sgt. W. G. Blight; Sgt. R. L. Brandow; Sgt. B. F. Brown; Sgt. I. R. Brown; P/O. J. P. Bulands; Sgt. E. B. Clampitt; Sgt. C. W. Cockaday; Sgt. P. J. Cozens; Flt. Sgt. P. W. Davis; Sgt. L. Dutton; Sgt. T. W. Foran; Sgt. S. G. Giffin; Sgt. J. M. Greer; Sgt. G. W. Herrington; Flt. Sgt. K. L. Howard; Sgt. W. A. Kopacz; Sgt. S. A. W. Lea; Sgt. J. D. McDonald; Flt. Sgt. S. R. Millar; Sgt. J. Paplowski; Sgt. P. Rudick; Sgt. H. C. Sleep; Sgt. A. J. M. Smith; Sgt. C. S. Snider; F/O. J. G. Speir; F/O. F. L. Todd.

MISSING, BELIEVED KILLED IN ACTION.—Sgt. E. Johnson; Sgt. G. C. McDougall.

MISSING.—Sgt. M. J. Bavaconti; F/O. M. L. Brechin; Sgt. R. W. Briggs-Jude; Sgt. J. E. Cameron; Sgt. R. S. Dutka; Sgt. J. D. Este; F/O. G. D. Kain; Sgt. A. G. Knuttila; Sgt. M. Lavoie; Sgt. L. B. McBride; F/O. D. H. McKay; Sgt. T. E. Martin; F/O. R. C. Scott; Sgt. J. S. Silver; Sgt. S. E. Towle; Sgt. G. R. M. Warren.

MISSING, BELIEVED KILLED ON ACTIVE SERVICE.—F/O. C. Watson.

KILLED ON ACTIVE SERVICE.—Sgt. W. B. Bettin; P/O. W. C. Walsh.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED ON ACTIVE SERVICE, NOW PRESUMED KILLED ON ACTIVE SERVICE.—Act. W/O. E. Carmichael.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—Flt. Sgt. W. S. Guertin.

Royal New Zealand Air Force

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—F/O. J. G. Duffill; P/O. R. H. Dunckley; Sgt. J. C. Gray; F/O. D. E. O'Donnell.

MISSING, BELIEVED KILLED IN ACTION.—P/O. R. S. France; Flt. Sgt. R. W. Gray.

MISSING.—Flt. Sgt. F. P. Lundon; P/O. D. R. Moss.

South African Air Force

MISSING, BELIEVED KILLED ON ACTIVE SERVICE.—2/Lt. M. Roux.

KILLED ON ACTIVE SERVICE.—Lt. J. I. Brener.

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F. Lodge;
J. McAleer;
A/C. L. L.

Force
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SSING, BE-
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Sgt. L. F.

SSING, NOW
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Devlin; Sgt.
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O. H. Skel-

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. G. Blight;
; Sgt. I. S.
S. Clampitt;
s; Flt. Sgt.
W. Foran;
Sgt. G. W.
Sgt. W. A.
McDonald;
owski; Sgt.
. M. Smith;
F/O. F. L.

CTION.—Sgt.

F/O. M. L.
Sgt. J. E.
Este; F/O.
M. Lavoie;
McKay; Sgt.
J. S. Silver;
en.
ACTIVE SER-
. B. Bettin;

BELIEVED
PRESUMED
W/O. R.

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G. Duffill;
F/O. D. K.

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P/O. D. B.

Force
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. I. Brener;